Homestead of Messrs. Beamish Bros., Hilda's Kraal Farm, Nyamandhlovu.

THE RHODESIA

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

AGRICULTURAL UNION CONGRESS.—The annual meeting of the Rhodesian Agricultural Union will be held in Salisbury, commencing on Monday, 17th March next.

MAIZE GRADING.—The latest official estimate of the United States maize crop for the season places the total much below average, and considerably less than had been expected. Reports from other countries

also indicate that there will be no unusual amount of maize available to meet the world's urgent demand for food stuffs. It may fairly be anticipated, therefore, that any country having a surplus of maize to send to Europe will get good prices for it, provided quality is up to standard. There can be little doubt that Rhodesia will be able to export this year an appreciable amount of grain, and, though it may not seem much compared with the production of other countries, it is of the first importance to our local growers that they should get the full benefit of a firm market. This can be ensured by taking care that only our best is sent abroad, for Rhodesia's best is not "second best" to any maize in the world. Only by careful grading can this desirable result be secured, and we would direct attention to an exhaustive article in this issue which deals with the question of maize grading in respect to its necessity in the interests of the industry and the methods by which it is put into practice. We trust every maize grower will give this subject close study.

Danger in Mealie Tanks.—Particulars of the sad death of a native, returned after due enquiry as misadventure, have come to our notice, and as such cases may readily occur through the ignorance or negligence of Europeans or natives alike, a warning and explanation may not be out of place. In the case referred to, grain was stored in a corrugated iron tank 7 feet high and about 11 feet in diameter, with an opening at the top 15 inches in diameter to put the maize in and a small hole at the side kept locked for withdrawing the grain. The key of the lock was lost, so a boy was lowered into the tank to pass the grain up to another at the manhole, who handed it down to a third on the ground, a laborious process which the purchase of a key might have saved—apart from the cost of the boy's life. The tank was nearly empty, and the grain at the bottom is supposed to have been that first put in, which was rather wet and immature, or rain may have entered through the manhole recently. However that may be, the grain was partly sprouted and mouldy, and previously the boys had observed an evil smell from it. The boy was put into the tank and seen to fall senseless. The master when called realised the position, and by means of a noose on a rope hauled him out and applied artificial respiration, but without avail.

Although in this case moisture no doubt set up fermentation, which liberated carbonic acid gas, which was the cause of death, yet it should be remembered that even dry grain in such a closed chamber may have the same effect, and the greatest caution is always to be observed in going or sending anyone into such a place, grain stores and silos and wells being always suspect. As a precaution, it is well to lower a lighted candle first, and if this is seen to burn low or be extinguished, steps should be taken by lowering sacks and waving them, or otherwise to induce ventilation, before a human being is allowed to go down, and in such cases they should be lowered on a rope, so that they may be pulled up on first signs of collapse.

It is better to be soon than sorry.

Bulawayo Agricultural Society.—We have seen the report and balance sheet of this society for last year, and we can heartily congratulate the committee and members on the position and progress shewn. The society has 390 members, of whom no less than 120 are life members, 50 of the latter being additions during the year. That the society is well supported by active and wealthy friends is further indicated by the fact of nearly £1,500 for donations in the year. The society's liability to sundry creditors (£1,377) may seem rather heavy, but from the report it is evident that this is due chiefly to necessary capital expenditure in the direction of improving the accommodation and equipment of the show ground. This is not unproductive expenditure, for it tends to augment the profits on shows, which profits, at present rates, will soon abolish the indebtedness. The Bulawayo society has been largely instrumental in awakening amongst the cattle breeders and dealers of the Union an interest in Rhodesia, and by attracting buyers from the south, and it has distinctly benefited the cattle industry of the whole country.

The Gwelo Christmas Fat Stock Sale.—The very handsome cash prizes offered by Mr. A. E. White at his Christmas sale on 12th December succeeded in attracting some 50 first-class slaughter animals, which may fairly claim to be the best and most representative exhibition of the kind yet seen in Rhodesia. Breeders from Bulawayo on the one hand and Salisbury on the other competed keenly with local men. The principal event was the competition for a £50 cash prize offered to the owner of the best eight slaughter bullocks. Mr. Duncan Black secured it with eight very prime steers, four of which were sired by an Aberdeen Angus bull and two by a Red Poll bull. All were black, and but for the heavier bone of the Red Poll crosses, which somewhat detracted from the uniformity of the group, we have seldom seen a better lot. They averaged something in the neighbourhood of £19 a head at subsequent auction. Mr. Tom Bradshaw, manager for Major Bolitho's Trevelloe Estate, was the runner-up with seven Shorthorn crosses and one South Devon. While this lot were uneven in colour and size, they were most excellent individually. They were, we believe, the first lot of eight slaughter bullocks to be shewn in halters, trained to lead and conditioned like pedigree breeding stock. They formed a splendid object lesson to the younger generation of farmers in how to show cattle, and we feel sure that Mr. Bradshaw's example will be followed by many exhibitors at future shows. Messrs. Roberts & Letts, of Bulawayo, competed in this class with a wonderfully nice even lot of Shorthorn grades, mostly sired by their old bull Baronet. Unfortunately they lacked condition, and for that reason had no chance in a class of such well finished animals. The award for the best four steers was secured by Messrs. James & Worthington, who beat a first-class exhibit of Devon-Africander bullocks belonging to Messrs. Coles & McKenzie with a pen of perfectly conditioned Shorthorn-native crosses. Messrs. Coles & McKenzie's bullocks, while excellent as to quality, had the misfortune to have one of their number sick the day before, and even so, they ran the winners very hard, and were beaten on a question of finish as regards feeding. Messrs. James & Worth-

ington shewed a second lot of four bullocks. They also competed successfully with two similar Shorthorn-natives, which beat two young South Devon-Africander steers shewn by Major Bolitho and two Devon-Africanders shewn by Messrs. Coles & McKenzie in the class for the best pair of oxen. The prize for the highest priced animal went to Major Bolitho, whose South Devon-Africander steer fetched £26. His live weight was 1,500 lbs., and he was estimated to kill at 900 lbs. The average live weight of eleven beasts shewn by this breeder was 1,328 lbs. Unfortunately all the exhibits were not weighed, and it is therefore not possible to estimate the prices realised per 100 lbs. exactly, but they averaged about 45s.

Assistant Agriculturist.—The staff of the Department of Agriculture has been strengthened by the appointment of an additional Agriculturist to cope with the advisory and instructional work carried on amongst the farming community, particularly that relating to experimental investigations and the introduction of new crops, maize grading, farm practice and the use of fertilisers and questions relating to arable farming in general. In the prolonged absences of Messrs. Mundy and Walters, multifarious tasks will fall to his lot, but on the return of these experts it is hoped he may be freed to specialise in certain branches of agriculture.

Mr. Charles Mainwaring has recently been in charge of the experimental work carried on at the Government Experiment Farm and School, Potchefstroom, Transvaal, and is well qualified to conduct similar enquiries here. He has returned from active service, prior to which he had prolonged agricultural experience in South Africa. No doubt the appointment of Mr. Mainwaring will prove an acquisition to the farming industry of Southern Rhodesia, and his services will be in demand by our farmers.

An Ancient Cow.—We have received from Mr. T. Whitfield James, of Chitanga, Victoria district, an authenticated, but none the less astonishing, record of a Mashona cow which lived to the ripe old age of twenty-six years. He writes as follows:—"She salted from rinderpest at the Berlin Mission Station at Chibi in 1895, when she was a three-year-old heifer, and I had to kill her last October through her becoming blind, otherwise she was perfectly healthy and reared a nice heifer calf last year."

This speaks volumes for the native breed, and constitutes a record it will be hard to excel. She survived rebellions, rinderpest and coast fever.

An Ancient Cow.
A native cow, the property of Mr. T. Whitfield James, Victoria district. Cow killed when 26 years old; she reared a calf in her last year.

Maize Grading in Southern Rhodesia.

By Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.

There is ground to believe that considerable misunderstanding exists in the minds of many farmers as to motives underlying the practice of grading maize prior to export, the utility and advantages of such a proceeding and the system under which it is carried out. To clear away these misconceptions and explain the motives and methods of maize grading as carried out in Rhodesia and South Africa generally the following notes have been written.

During the year 1914 interchange of views took place between the Governments of Southern Rhodesia, Portuguese East Africa and the London Corn Trade Association, as a result of which grading in Rhodesia, as the country of origin, was decided upon, coupled with examination, in respect to moisture and freedom from weevil, at Beira, the port of shipment. From that time onwards grading has been conducted in Rhodesia, so that we have now had five years' experience of the system. The quantity handled has fluctuated according to the crops and the facilities obtainable for export; the heaviest export being in 1915, when 318,926 bags were graded.

THE OBJECT OF GRADING.

Comprehension of the aim of grading is necessary to the farmers and dealers as much as to the graders. If the requirements are understood, they can be the more readily complied with, and the task of the grader understood and rendered, for that reason, easy, more precise and reliable. It is not sufficient for the farmer merely to acquiesce in the idea of grading; he must, in his own interest, give practical assistance by preparing his maize in such a way as to ensure a maximum passing the highest standard possible. He retains for local use what he knows would not pay so well to export. He submits for examination grain likely to pass, and properly bagged for export.

The first object of grading maize is to enhance the price obtained by the grower. To this end, before it leaves the grader's hands, it is examined and the quality marked on every bag. Rhodesian maize possesses a certain intrinsic superiority of its own, based on size, plumpness, uniformity of appearance, cleanness and soundness, due largely to the facts that it is air dried and not kiln dried, as in other countries, and that it is free from admixture of yellow grains, giving it special value for certain purposes. We wish to take full advantage of these merits, and to obtain the correct, but also the utmost value of the

qualities enumerated above. We would mention particularly the need for uniformity in a country like Rhodesia, where our output for export is not likely to exceed a million bags for some time to come. It will pay us to build up a reputation for that particular class of maize for which our country has already shewn itself to be specially fitted. To increase the value of every bag graded, to the advantage of producer and all others dealing with it subsequently, is the immediate motive of grading.

There is yet a further reason, or rather a wider aspect of the same idea. By indicating the quality on each bag, and by preventing the export of inferior produce, we establish and preserve the confidence of buyers, who rely upon our marks and buy thereon without inspection, thus enormously facilitating business at both ends. The reputation of Rhodesian maize is thus built up, and a demand secured which guarantees to our growers a market at the best prices obtainable at any particular moment and from year to year. Grading, therefore, has the object not only of securing the best possible price, but also of increasing and developing the trade in our maize, and establishing it as a recognised and reliable commodity in the world's markets, to make the most of our good name, and to advertise our wares.

Our maize also has to be fit for prolonged storage pending transport to the coast, possible delay there before being loaded, and for a lengthy voyage thereafter, whether to Europe by the east or west coast, to Australia or elsewhere.

That these various objectives have not been completely secured as yet must be admitted, but this is entirely due to the fact that for the last four years there has not been an open and discriminating market. Now that normal conditions are being restored, and maize is likely to be in demand for many purposes for which it has hardly been available of late, it is probable that very material differences in price will be made between the various grades. It will be remembered that the Imperial Wheat Commission made no distinction in price between grades I. and II., but would not buy any grade III. Even so, however, we have repeatedly and authoritatively been assured that our policy is the right one, and should be adhered to, and that the merits of Rhodesian maize are already known and appreciated. We may, therefore, fairly expect to reap the reward of our reputation for fair description in grading, for scrupulous care, and for reliability.

We have been authoritatively assured that Rhodesian maize is well known and appreciated on the London market, and that it will always command a higher price than maize from countries where the grading standard is not so strictly adhered to. We are advised not to alter our standards or system. If our examination is more strict and precise than that of other countries where the same standards of quality have been set up, but where the grain itself is not so good, this is all to our advantage in a free and unrestricted market, where differences of quality imply corresponding differences in price, where strict adherence to standards is certain to be well rewarded, and reputation is everything. It would be a grievous mistake to err on the side of leniency in grading.

It is sometimes contended that, though the wording describing the grade is the same, the grades of Rhodesia are of a higher standard than

those of the Union, and there is no advantage to the Rhodesian farmer to put a better quality of maize on the European market than that being supplied by the Union. Against this it may be said that there is now a tendency, both here and at Home, whilst adhering to the same grade description as that in the Union and Portuguese East Africa, to discriminate by describing our maize as "Rhodesian" in order to ensure to us the benefit of any superiority which may exist.

Another reason why the Government grading of maize is practised is that it is virtually obligatory upon us, since no grain is accepted for despatch from any port, whether of the Union or of Portuguese East Africa, without graders' certificates and marks. Hence compulsory grading of maize is automatically applied to Rhodesia.

Grading is only called for in the case of maize intended for export; not for the entire output of the country. No law compels the grading of maize in Rhodesia to-day, yet the same result is reached through the action, a very proper and reasonable action be it understood, of the South and East African port authorities in refusing to permit the export of any ungraded maize. The Government of Mozambique territory has, since September, 1914, required that all maize from Rhodesia passing through the port of Beira must be accompanied by a grade certificate issued by the Rhodesian Administration, and further, that all such consignments are subject to examination with regard to soundness, moisture and weevil, at date of loading aboard ship, by the official grader at Beira, who issues a certificate to that effect, which certificate is attached to the one accompanying the consignment from Rhodesia.

GRADES.

The standard classes for grading adopted in the Union, in Portuguese East Africa and in Southern Rhodesia so far as flat white maize, our only export type, is concerned, are as follows:—

F.W. 1 = *Flat White* 1. To be sound, dry, plump and well cleaned, with a maximum of together 1 per cent. of yellow, discoloured or defective grain.

F.W. 2 = *Flat White* 2. To be sound, dry, plump and reasonably cleaned, and not containing more than 3 per cent. of defective grain and 5 per cent. of other coloured grain.

F.W. 3 = *Flat White* 3. To be sound, dry and reasonably cleaned, and not containing more than 8 per cent. of defective grain, and 5 per cent. of other coloured grain. Berries may be of irregular size and shape.

(Not marked) = *No grade.* To include all maize which cannot be classed in a higher grade, but in dry condition, and fit for shipment.

The letters "F.W." stand for "flat white," the trade description used to denote the class of maize which includes our Hickory King and Salisbury White maize. In addition to the four designations, F.W. 1, F.W. 2, F.W. 3 and No grade indicated above, the Union Government recognises grades for round white as compared to flat white, and for round and flat yellow and round and flat mixed maize, with all of which we in Rhodesia are not interested as staple exports. It

will be seen that there is no limitation as to grades exported, but it will probably pay best to export the best, particularly F.W. 1 and F.W. 2. Automatically we may be sure that, of our available surplus, merchants will find the top grades the more profitable to export, as the cost of rail and ocean freight is the same on all.

GRADING.

The grader's mark on the bag is the buyer's guarantee that the grain is up to the standard indicated, and is accepted as such in the London market.

The method of grading in Southern Rhodesia is the same as that adopted by the Governments of the Union of South Africa and of Portuguese East Africa. The duty of the grader is to gauge the standard to which a bag belongs in accordance with the above official definition of grades. This depends mainly on the character of the maize, but also on the percentages of discoloured and defective grains, and of impurities, including broken grains, chaff, dirt and foreign matter.

The defects of maize generally are detailed below, and it is for the grader to assess these singly and in combination, in order to fix the grade and mark the sack accordingly. Other points taken into account are also indicated in the following paragraphs. The skill of the grader rests upon his ability accurately and rapidly, from his sample as he examines it, to judge to what grade each bag is to be assigned. In compliance with the definitions given above, and in addition thereto, the attention of the grader is directed to the following points.

Discoloration due to admixture of yellow maize is practically non-existent in Rhodesia, as yellow varieties are only grown to a very slight extent, and that in non-exporting districts. This fortunate fact gives Rhodesia a great advantage in being able to offer to the world a really pure white maize which is specially in demand for many purposes. Coloured grains, not necessarily yellow, may occur as a sport in any crop; brown, purple, striped and sometimes almost black berries occasionally appear. Discoloration may also be due to weather or to fungus attacks. Any grain other than white ranks as discoloured in a white class. Discoloured cobs are best rejected during husking, a step which is impossible where a mechanical husker is employed.

The presence of impurities such as dirt, chaff, sweepings and broken grains is a cause of condemnation. This is easily avoided by adequate winnowing and screening. Negligence in supervision during shelling operations is the main cause, and this is within the farmer's own power to rectify, though it is surprising to what an extent the grain is not properly screened and cleaned.

Much more of our grain would rank as first grade if by sieving the small tip grains were separated out, as these, besides reducing the general appearance of the sample as to uniformity and plumpness, are also frequently defective in other respects, immature, attacked by insects, or discoloured.

Cracked and broken grains are due to defective shelling, overloading the machine in undue haste to complete the work without regard to

injury to the grain. Grain is sometimes damaged by being partially eaten by white ants, rats, mice and jackals before being harvested.

Whilst it is not incumbent on the grader to weigh each bag, yet should he observe any to be manifestly underweight, it is competent for him to refuse to pass same until made up to such weight as shall give reasonable prospect of the bags weighing 203 pounds on arrival at their ultimate destination.

Sacks shall be new, not patched nor second-hand. The qualities in general use are $2\frac{1}{2}$ pound gunny bags. A quality 8 x 8, or B quality 8 x 6, twill, and the size is 44 inches by $26\frac{1}{2}$ inches. Experience has shewn that $2\frac{1}{4}$ pound bags are not sufficiently strong for export, and are accordingly rejected both in the Union and here. Every bag must be double sewn with good twine, and made fast by passing twice through the lug, and a special knot. Every bag shall be provided with two lugs at the corners of the mouth. The grain will be disqualified if these requirements as to bags and sewing are not complied with. The requirements as to bags, lugs and stitching will no doubt be regarded by many as severe, but they are most emphatically in the interests of the exporters, for the losses in transit are borne by the shippers, not the consignee. From defective bags, particularly when not double sewn and properly knotted through the lugs, the leakage is very serious. Absence of lugs renders handling difficult and often leads to bags being burst or even lost overboard from lighter or ship. Old patched, or even new bags if thin and inferior in quality, also occasion serious losses; hence new gunny bags, $2\frac{1}{2}$ pounds, A or B quality, must be insisted upon, and the twine used in sewing should be good. These accidents mainly occur at Beira, and they might be much diminished if greater care were exercised in the first instance by the farmer in the manner indicated. It is important that graders should be strict in insisting on all requirements being met in these directions.

Wet maize must, before grading, be dried, then examined and graded for export, and the certificate endorsed "wet maize dried to the satisfaction of the grader." Reasonably dry maize still contains some moisture, and the maximum permissible is 12 per cent. of moisture, a standard easy to maintain in Rhodesia. Should the grader have any doubt about the dryness of a particular parcel of maize, he should pack a sample in securely sealed bottles or boxes, and despatch promptly to the Department of Agriculture for testing. Except where the grain has actually become wet by rain or accident, dampness is in our dry winter climate attributable to harvesting the grain too early in the season. Our maize is apt, on reaching sea level, to absorb moisture from the atmosphere.

Weevilled maize is graded according to the merits of the grain, but on the certificate it is to be recorded as "weevilled." Such maize is separately dealt with in shipping, and must not be consigned along with clean maize, which it would contaminate. A special inspection takes place at Beira to ascertain that the maize is free from weevil, and the slightest trace is sufficient to condemn it. The London Corn Trade Association gave special consideration to this point, and has ruled that weevilled maize may be dealt with provided adequate steps are taken

to prevent contamination of clean maize. As weevilled maize is saleable, and has different values according to its grade, it should be graded also. Weevil is happily of rare occurrence in Rhodesian maize prior to the end of November, before which date export ought normally to have concluded.

Musty maize may in no circumstances be exported, and is at once to be rejected, no certificate of any kind being issued in respect of such grain. There is really no need or excuse for mouldy maize in Rhodesia, and in consequence of our climate the condition is a very rare one with us.

The season for grading lasts normally from about the 15th July or 1st August, when the grain is being brought to the stations, until 1st to 15th November, after which date export becomes difficult owing to the beginning both of the rains and of the Cape wool shipping season. Grading at other seasons can only be undertaken in exceptional circumstances. Grading is performed as nearly as possible at the date asked for by the exporter.

Graders will examine every bag individually without fail, and grade and mark each bag on its own merits. The marking of bags is to be done personally by the grader or in his presence, and under his direct observation. Responsibility for any error in marking rests with the grader.

The quantity withdrawn from a bag by the testing tool is on an average one two-thousandth part, or about one-and-a-half ounces. If for any reason a second probing is necessary, as much again is taken; therefore, as far as possible one sample only should be taken, and two or more only in cases of doubt. The grain withdrawn is to be retained in bags, all of one grade being put together. The grain thus collected serves as a valuable check on the grader's mental standard, and samples of these are directed to be sent to headquarters at least once a week, indicating the dates, place marks, and the grader's name, in order that his work may be controlled. All grain so collected is to be regarded as the property of the Government, and in no case is it to be retained or appropriated by the grader or any other private person.

Maize will not be examined unless or until stacked at a railway station or siding in tiers six high and two deep, with the sewn ends outwards. If maize is ridden in late in the season, it is a wise precaution to lay corrugated iron on the ground to prevent dampness and white ants from getting at the bags. Bags not disposed of as indicated above will not be examined by graders until they have been properly arranged for the purpose. Only in exceptional circumstances can maize be examined elsewhere, or if arranged in any other manner.

Graders perform their work at different centres, and along certain sections of the railway line, subject to control from headquarters as to travelling and performance of their duties. The Salisbury Farmers' Co-operative Society, and other exporters of maize, notify the presence of maize for grading at various points to the District Traffic Superintendent of Railways, who arranges directly the movements of the graders according to traffic needs. The graders advise the railway

authorities directly of completion of grading at any point, and forward to the officer in charge of their work reports, together with samples for checking, which also serve as the standard samples of average quality of each grade for the season for purposes of reference and control. The railways transport the graders and their boys as circumstances require. The Government furnishes the necessary equipment, consisting of testers, red ochre, lamp black, oil and pads, stencils, dies, buckets, bags for samples, standard samples, bottles for damp samples to be tested, counterfoil books of certificates, diary, stationery and franking authority; where necessary a patrol tent is supplied. Loading of grain on trucks is performed by the owner or agent, despatching by the railways.

Grading is performed at the time, or as near as possible to the time, asked for by the grower or exporter, and the grader cannot be blamed for any subsequent delay in despatch which may take place. In the past it has not infrequently happened that many weeks have elapsed after the date of grading and before despatch. If much rain intervenes, the deterioration may be so serious as to lead to the grain being condemned by the inspector at the port of shipment. Such delay is also undesirable, as it militates against the purpose of grading, a proof of the condition and quality of the maize at the time of despatch from the country of origin. After grading, deterioration may occur through damp, weevil, ants or rotting of bags. The inspection at Beira is therefore a useful check. One way of rectifying the matter is to render all graders' certificates only operative for a limited period, thus necessitating re-grading where any considerable delay has taken place, and the desirability of introducing this principle deserves consideration. Grading should be carried out, so far as practicable, in the order of despatch. The trouble may become acute if we have a heavy crop next year, and trucks and ships continue to be limited.

COST OF GRADING.

It has been suggested more than once that a fee for grading should be charged. Such a fee would have the advantage of restricting the amount submitted for examination to grain likely to be passed, also to grain actually intended to be exported, for it would be unnecessary to incur the expense of grading maize for local consumption. The idea of the fee is that those who immediately benefit should defray the cost of the service and not the public at large. For the official examination at Beira a fee of one halfpenny per bag is already levied. In the Union a charge for grading is made of one penny per bag. So far no charge has been made in this Territory, but it is not impossible that such a step may some day be found necessary.

GRADERS.

The actual process of examination has in the past been taught to every grader during a course of systematic training, and before he is allowed to pass a single bag on his own responsibility he has had to give proof of his competence and comprehension, not only theoretically of the standards required, but also by practical test as well. Difficulty has been found in ensuring consistent adherence to the standard fixed, and

a system was devised of checking the work of the graders by having samples sent in weekly to headquarters representative of the grades being taken. Samples suspected of being over-moist have to be sent to Salisbury for examination at the laboratories of the Department.

DEFECTS OF GRADING.

The work of grading, since its inception, has had to face not only the difficulties of a new system not thoroughly understood by those affected by it, but also peculiar difficulties brought about by the war. Besides the officers primarily in charge, all the staff originally employed, also several subsequently engaged, have at different times gone on war service, necessarily disorganising the work and increasing the difficulties of management. The system involves co-operation between farmers, the co-operative societies and other dealers, the railways, the shipping agencies, and the grading staff. The unavoidable changes of personnel, the novelty of the subject, with consequent lack of local experience, the fluctuating quantities handled each season, the railway difficulties and shipping shortages all tended to accentuate the difficulties of carrying out the process. That matters went as well as they did is due to the general good feeling that prevailed amongst those concerned, the realisation of the position, the mutual help and occasional forbearance, the willingness to do the best possible in adverse conditions.

If perfection of procedure was not realised, yet allowances may be made in the circumstances, and on the whole the work has been carried on since 1913 with a fair measure of success. Any complaints made were investigated, except when these were not directed to the proper quarter, but spread as vague rumours or addressed to the Press, methods calculated to exercise the maximum amount of injury with the least individual responsibility, and to be mischievous without effecting an improvement. With the return of stable conditions, with larger quantities to deal with, better facilities for transport, with regular shipping and normal staff to grade and handle consignments, and with the benefit of experience gained in these past arduous times there is reason to anticipate that the grading and export of maize should be conducted smoothly and satisfactorily in the future.

Owing to causes indicated above, weakness in our grading system hitherto lies in the fact that the graders have had to be trained as required, and are only temporarily engaged. With a changing personnel no continuity of standard can be relied on, experience gained each year being lost; fresh instruction is necessary each season; strangers are employed who do not know the work, the farmers, nor the railway officials with whom they come in contact; these strangers may or may not be trustworthy; temporary men can neither be trained, controlled nor depended upon so well as permanent. So far as possible in present circumstances steps have been taken to remedy this state of matters. We recognise the difficulties of the past, and hope to overcome them and to grapple with the task of grading maize in whatever quantities the season and the energy of the growers may provide. To ensure success in grading, the confidence, support and help of the farmers who grow the maize and prepare it for examination is essential. The methods and

aims of maize grading have here been expounded, so that farmers may grasp the reason and objects of grading, understand how it is done, and what constitutes the requirements of different grades.

GRADING IN SOUTHERN RHODESIA.

Previous to 1913 all Rhodesian maize was graded wholly by Portuguese officials at the port of Beira. As our exports of maize began to attain considerable dimensions and to become a regular feature of our annual trade returns, it was soon apparent that the grading ought to be carried out in this country. The grade must be fixed in the country of origin, even where, as in our case, that country has no seaport of its own, a circumstance in which Rhodesia is peculiar among the maize exporting countries of the world. No foreign State should dictate as to the relative standards of quality of the produce of another country, though in our case it is perfectly proper, essential even, that at the port of shipment in Portuguese East Africa a certificate of soundness—apart entirely from grading—should be given. Since grading is practically obligatory, it is preferable that the grading should be in our own, rather than in foreign hands.

The London Corn Trade Association on 8th July, 1914, after consulting with the trade as a whole, agreed, "(a) that all maize for export should be graded in Rhodesia to the standard of the Union Government by an official grader, who would grant the usual certificate in respect of such maize, and (b) that each shipment be accompanied by a further certificate to be issued by the official grader at Beira to the effect that the grain was sound, dry and free from weevil at the date of shipment." For the benefit of the uninitiated, it may be explained that the London Corn Trade Association is the competent and controlling body, representative of the buyers in our principal market, the market through which we are likely to reach all the main consumers of our speciality—flat white maize of superlative excellence. Since 1914 our export maize has been all graded in Rhodesia, with no complaint as to the principles adopted, and only comparatively few regarding details, all of which were capable of settlement. The system is officially described as entirely satisfactory to the buyers in England, and is there quite well understood and approved.

There is amongst British buyers a not unnatural preference for a British certificate, a feeling of which we are right to take advantage. It is to be borne in mind that, in accordance with the established usages of the corn trade, the purchaser may not see the maize he buys, the sale being effected on the grading certificate from the country of origin. As in our case these certificates are issued, not as elsewhere for a consignment put on board ship, but for one put on rail at inland stations, there was some hesitancy at first as to accepting these certificates. Happily, however, these prejudices have been overcome by means of thorough and scrupulous examination, and to-day the only adverse criticism of Rhodesian maize remaining is on account of loss of weight through bags supposed to contain 200 lbs. of grain actually falling short in this respect on arrival at their distant destination. In practice, however, this fault is not so serious as was at first anticipated.

It is obviously desirable to ensure to the original grower as much as possible of any enhancement of value due to grading, and therefore the process should be carried out at the earliest possible stage. This is a strong argument against grading at the coast, when the grain has probably passed into other ownership, or the bags are inextricably mixed with those of other farmers. Again, by grading before ownership is changed or confused, each individual can benefit by ascertaining the precise grading of his own crop, and the proportions of each grade which he has secured, thereby learning how far there is room for improvement. This lesson is often perhaps disappointing, but is none the less salutary, and induces, as nothing else, efforts at improvement by the individual. Taken over the entire community, this must exert a very far-reaching, cumulative and beneficial effect.

Certain exporters of maize from Rhodesia require, in terms of their contracts with oversea buyers, to send only particular grades. To achieve this grading before placing on rail is essential, as the exporter in such instances only arranges to buy from the farmer the grades in question, and other grades are not taken.

The reasons advanced above seem sufficient to justify the practice of grading Rhodesian grown maize in Rhodesia.

GRADING AT THE COAST.

Every port is rightly jealous of the reputation of the products exported therefrom, upon which its trade depends. Before maize was largely or regularly exported from Rhodesia, examination took place at the port of Beira, but during the past five years grading within the Territory prior to export has been practised. It is occasionally still contended that grading at the coast would be more expeditious, and more economical of graders' time through a greater concentration of work. More generally it is now accepted that grading should preferably be conducted in the country of origin. Maize examined and rejected in Rhodesia can readily find a market, but maize rejected at Beira might have to be shipped and sold at a very low profit, probably more often at a considerable loss, or might even be prohibited export, in which case it would either be dumped in Portuguese territory and sold for what it would fetch, and in addition have to pay customs dues in that country, or else it would have to be railed back to Rhodesia for sale, probably again at a loss after the double carriage and all charges had been met. If exported, such below-grade maize, though unmarked, would probably be traced back, and would prejudicially affect the reputation of maize from Beira, and from Rhodesia. It is to avoid such probable losses and damage to our good name that it is desirable to prevent inferior maize ever leaving the country. Such maize might itself be sound and wholesome food for local consumption, and when so used would liberate corresponding quantities of the best for sending away. In this connection it is always to be recollected that the larger the quantity of good grain we can send away the more likely is it to be known and in demand for industrial purposes, for manufacturers are not likely to become buyers unless they can be guaranteed a certain quantity.

It is sometimes erroneously stated that our maize is sold on the Beira graders' certificate, and that the Rhodesian certificate is valueless. This, as indicated above, is not so. The certificate from the port of Beira is complementary to ours, useful and necessary, but refers only to condition in respect of being dry, sound and free from weevil at date of shipment, not to quality, and carries with it no guarantee of origin and grade. Weevil, mould and moisture are only likely to be observed in Rhodesian maize at Beira if the grain is unduly detained there, and in the case of maize sent from Rhodesia very late in the season, which, however, is not likely to occur to any extent. Past experience has shewn that, owing to climatic conditions, maize from Rhodesia should not be kept at Beira longer than two to three weeks, as it is liable to become weevil infested, damp, and even mouldy if kept there any length of time. Maize graded up country can be sent to the coast when steamers are due or actually loading, and so remain at Beira for a minimum time. There is not sufficient storage accommodation at Beira for a heavy Rhodesian crop to be stacked there, so as to be accessible for grading.

There is therefore no great prospect of a return to the old system of examination of our maize at Beira.

GRADING ON THE FARM.

It is sometimes argued that, as it is obviously advantageous to us to grade our maize before it is trucked, it would be still more advantageous to do so before it leaves the farm. To such a proposal there are, if not objections, at any rate difficulties which in the aggregate render the idea hardly feasible, while the benefits when closely examined appear more imaginary than real. Farmers are by no means unanimous in desiring grading on the farm; indeed only a few have suggested it as calculated to save them some trouble and expense, and to reduce risks of pilfering, and damage by white ants and fire.

It is only proposed to grade maize for export. To examine maize for local use would, under existing conditions, be needless labour and expense. There is no assurance that maize graded on the farm would be exported. No doubt it would assist the grower in selling it for export, but this small convenience would be gained at much extra expense to the public in general. Maize graded on the farm might easily be manipulated by unscrupulous persons, and though such dishonest practices are unlikely, they are not impossible, and must be guarded against. It is not right to open the door to fraud.

In most countries grading is performed at the port of shipment. For reasons indicated elsewhere, this is undesirable in our case, and the nearest approach thereto is the point of despatch by rail. Buyers desire, and indeed require, that the examination should take place at the moment of export, or as near that date as possible. Grading on the farm would not, therefore, be acceptable to the buyer, and if it were to be instituted it would be detrimental to the sale of our maize. Grading at or near to the time of despatch is necessary in order to remove, as far as may be, possibilities of confusion as to the identification of the certificates accompanying consignments.

The conveyance of graders from farm to farm is an objection, not in itself insurmountable, but a contributing reason against the proposal, and much greater than those who suggest this procedure recognise. Whilst the grading season is on, the work is strenuous, and much time would be taken up travelling from farm to farm—not necessarily the next door one—which would mean extra expense and possibly extra staff.

In reply to the argument that the present system entails extra haulage, it may be said that farmers by now know something of grades, and need not send to the railway maize likely to be rejected. Moreover, below-grade maize, unless it is very inferior, is quite marketable within Rhodesia, so that it is not necessary to haul it back to the farm. Marketable grain has to go to the station in any case. Complaint of stacking for inspection being a burden on the farmer is a weak argument. Grain for despatch, unless it is to be kept a long time, is not stacked more than six bags, so the only extra labour involved is by arranging the bags in lines to give graders access to them. The Union Government grades at railway stations or sidings; not on farms.

FAULTS OF OUR MAIZE.

Five years of practical experience of grading has shewn us the defects most common in our grain. It should suffice to mention them to enable farmers at once to rectify these faults. The most frequent means of maize being lowered in grade or rejected is through the grain being broken in the process of shelling. Such cracked or broken berries die and are of no use where live grain is wanted. Rhodesian grain is alive, not dead as in the case of kiln-dried maize, and is for this reason preferred for certain industrial purposes. Cracked and broken grains being dead, or likely to die, are liable to become mouldy and unsound, whilst broken fragments only count with the dust and dirt, not with the grain. This fault is mainly due to the use, or rather the misuse, of power shellers, especially where these are unskilfully handled, and cobs fed in too fast, thus straining the machinery, breaking the seed instead of detaching it from the cobs, and overloading the sieves beyond their capacity, so that the broken grain is not removed. This is the case when the object of the contractor, paid by piece work, is to shell the crop as rapidly as may be, regardless of damage done to the grain. It is an avoidable fault, and one which farmers should take steps to prevent, whether shelling themselves or employing a contractor for that purpose.

The second most frequent fault is defective bags; old, patched, weak sacks which cannot stand the rough handling they must undergo, especially between the quay and the ship's hold. This is no mere arbitrary formality, and growers seem slow to realise that they are suffering losses of considerable magnitude, as they are paid on the outturn on arrival, which may be much less than what they reap in the field. Associated with this fault are defective stitching and knotting, lack of lugs and inferior twine, all responsible for much avoidable loss in transit.

Frequently maize is rejected or lowered in grade through not being cleaned, or insufficiently cleaned, a simple matter of attention to winnowing, for the neglect of which the farmer's pocket suffers. There is really

Homestead of Mr. S. H. Harnden, Silver Bow Farm, Rusape.

no excuse for grain to be dirty. The presence of chaff, dust, earth, foreign matter and floor sweepings in place of grain, if it exceeds certain low limits, is a contributory cause in loss of grade. Very seldom has any of our grain had to be rejected for dampness.

In addition to, or after being wet, maize is sometimes musty or mouldy, occasionally even being covered with fungus, when it is at once rejected. Discoloration is often observed, but not to a serious extent. Weevils are happily of rare occurrence, except late in the season, after our exports are over, though the pest may even be found in the growing ear at times. Damage by white ants, rats and mice is preventable.

It is to be remembered that, in seeking for the above-mentioned defects of grain and in ascertaining to which grade a sample belongs, the faults are taken into account, not only separately, but in combination with one another, and that it is possible that a little dirt, a little broken grain and a little discoloration may conjointly lead to depreciation in grain which had, say, the dirt alone been absent, might have passed.

Farmers often cannot understand the apparently arbitrary distinctions drawn between one bag and another in a lot all from the same field and the same dump and shelled at the same time, but the fact remains that bags do vary immensely and continually in the various directions indicated above, most of which are within the individual's power to control.

Comparatively rarely is our maize rejected for intrinsic demerits in the grain. Owing to the excessive rain and lack of sunshine last season, the quality of the grain, the size, plumpness, shape and general appearance were adversely affected, but these are only transient and accidental circumstances.

To avoid the faults indicated above, certain simple measures deserve to be more widely known and adopted than seems hitherto to have been the case:—

(1) Do not harvest maize before it is thoroughly dry.

(2) It is best to harvest the cob only, leaving the husk on the plant; in this way discoloured cobs can be discarded and discoloured tips removed.

(3) Take care not to overload the sheller, and do not feed more rapidly than the sieves are able to receive and treat effectively.

(4) Do not mix sweepings and small grain with the bags destined for export. It only means unnecessary cartage to the station.

It is to be observed that the defects of maize on account of which it passes into a lower grade or is disqualified altogether are very largely matters within the power of any farmer to rectify for himself. It requires only to be more widely realised that attention to these details will pay. During the war, when the same price was offered for grades 1 and 2, this was not the case, but discriminating buyers will certainly be prepared to differentiate in the price offered for different grades in future.

By systematic and conscientious grading it is hoped to obtain and maintain for Southern Rhodesian maize a reputation for quality and reliability second to none on the European markets.

Tobacco Cultivation.

THE IMPORTANCE OF SELECTING SEED PLANTS AND GRADING SEED.

By H. W. Taylor, B.Agr., Tobacco and Cotton Expert.

The general principles of selection are known to most practical agriculturists, and are practised by many. Every breeder of live stock understands the value of the prepotent sire which conforms to the standard of excellence for the particular breed, and also the value of mating the sire with selected females in order to raise the standard of quality in his herd. In the matter of field crops, most farmers appreciate the value of selected acclimatised seed. The maize grower knows from practical experience that seed properly selected from his own fields for a period of years will greatly increase his yields, on account of the particular variety having become acclimatised to the local conditions.

It has been, since the inception of the industry in Rhodesia, the practice of tobacco growers annually to import seed rather than use locally-grown tobacco seed. The erroneous idea generally prevails that, if locally-grown seed is used, the quality of the leaf will deteriorate. Some growers have stated that the tobacco will lose its aromatic properties, become coarse and unmarketable, unless seed is yearly imported from its original habitat. It is true that, unless rigid selection is practised, tobacco produced from locally-grown seed will deteriorate, as the tobacco plant tends to variation, and is very susceptible to changes in environment.

Every experimentalist is familiar with the fact that variation is the general rule in plants grown from imported seed or from seed produced through cross-fertilisation. The variation in tobacco is noticeable in the size and shape of the leaves, the number of leaves borne by individual plants, the spacing of the leaves on the stem, the colour of the leaf while growing, the tendency of individual plants to produce suckers, and the general appearance of the various plants. Each of these variations has an important bearing on the yield and quality of the crop. Variation is due chiefly to two causes: change in environment and cross-fertilisation. The former occurs in plants produced from seed imported from regions where the crop is grown under different soil and climatic conditions, and the latter is due to cross-pollination between varieties or between dissimilar plants of the same variety. It has been definitely established, however, that the tobacco plant readily responds to selection, and that a variety suitable for the conditions under which it is grown can be acclimatised in two to three years, and will thereafter reproduce true to the varietal type, if proper selection is continued.

Plate I.—Differences in character of leaves from plants of the same variety of tobacco. (From Bulletin No. 150, Connecticut Agricultural Experiment Station.)

Plate II.—Two rows of Connecticut broadleaf tobacco, shewing the possibility of the producton of early strains. Row on right raised from the seed of an early the production of early strains. Row on right raised from the seed of an early plant, and row on left from seed of a plant maturing at the usual time. (From Bulletin No. 96, U.S. Department of Agriculture.)

Plate III.—Four tobacco plants of the same age, shewing variation in time of maturity. (From Bulletin No. 96, U.S. Department of Agriculture.)

Plate IV.—Seed head covered with paper bag to prevent cross-fertilisation. (From Bulletin No. 139, Kentucky Agricultural Experiment Station.)

Selection; Preliminary Step.—The first step in seed selection is the study of the variety which gives the best results in a given locality. A careful study of any field of tobacco will reveal plants which shew great superiority of merit as compared with the surrounding plants, and for no apparent reason of soil treatment or other improved conditions. Other plants which have received the same treatment as their neighbours do not make satisfactory growth, and consequently reduce the yield and produce inferior leaf. By selection and proper handling, seed can be produced from the plants of superior merit which will produce a crop of tobacco the uniformity and quality of which will mean enhanced profits for the grower. It should be the business of each grower, then, to select those plants which, while true to the varietal type, respond best to the peculiar soil and climatic conditions found on each farm and often on different parts of the same farm. Once the grower determines the ideal plant for his local conditions, rigid selection should be practised until the type is fixed and the whole of the crop shews uniformity to the desired type.

Characteristics to be Noted in Selecting Seed Plants.—Even in the seed beds the variation in the shape of leaf can be noticed, but as the plants approach maturity the variation becomes more striking (see Plate I.). The leaf desired for manufacturing in South Africa is ovate in shape, and one which holds the width well out to the tip and which has a fine midrib. The leaf should not be less than 20 inches long before curing, and should have a smooth surface, as the latter characteristic is usually associated with a fine silky texture in the cured product. If the grower desires to produce tobacco suitable for cigarette purposes, the leaf should be fine in texture, thin, with fine venation and light in body. For pipe purposes, the leaf should be heavier in texture, larger and possess greater body. These characteristics are largely influenced by the character and treatment of the soil, but can also be very greatly induced by careful selection over a period of years.

The number of leaves produced by individual plants varies greatly. Plants grown on the same soil and with the same treatment have been noted which varied from 8 to 30 normal leaves. By selecting the plants bearing large numbers of leaves of normal size, the yield can be greatly increased without deterioration as to quality. This increase in the number of leaves is often not accompanied by an increase in the height, but is due to the shortening of the internodes, or the spaces on the stem between leaves. Plants bearing a small number of leaves usually have long internodes, while those bearing a larger number have correspondingly shorter internodes. Shamel & Cobey (1) have shewn that a large number of leaves to the plant has a decided tendency to reduce the growth of suckers which appear in the axils of the leaves. This reduces the cost of suckering, and allows the plant food elaborated to be used in producing valuable leaf rather than useless suckers.

The habit of growth of the leaf is also an important point for consideration. Leaves which are drooping or pendant are more easily damaged by heavy rains and wind than the leaves which are erect or at right angles to the stalk. The loss of the lower pendant leaves is often considerable, and should not occur if plants are selected for repro-

duction which have an erect habit of growth. This is often considered a minor point by growers, but is really most important. The lower leaves of the plants usually produce a bright grade of tobacco when the tips are not damaged, but once damaged through sand bruising or being battered by the winds, their value greatly depreciates. In flue-curing, the damaged portion of the leaf has a strong tendency to "sponge," and a small quantity of leaf so damaged may lead to severe loss of more valuable leaf during the curing stage. For seed purposes, plants should be selected which bear leaves with an erect habit of growth rather than with a tendency to droop, even though this habit is a consistent varietal characteristic.

For Rhodesian conditions, the period required for maturity is an important consideration. Generally speaking, this period can be reduced or extended by systematic selection (see Plate II.). In every tobacco field a great diversity (see Plate III.) as regards the maturity of the plants can be noted. This lack of uniformity in time of maturity is a great handicap during harvesting, and often leads to lack of uniformity in the cured product, as all of the leaves harvested are frequently not in the same stage of ripeness. For seed purposes, only early maturing plants should be selected, and the plants selected should ripen at approximately the same time, so that their progeny will shew uniformity in this respect.

The usual manner in which the leaves of the tobacco plant ripen is from the bottom upwards; the lower leaves ripen first, then the middle, and last the top leaves. The tobacco of the best colour and quality is usually obtained from the middle leaves. The bottom leaf is usually slightly damaged, and the top leaf usually becomes thick, heavy and cures dark, which latter condition may be caused by an excess of plant food being received by the top leaves after the other leaves have been stripped from the stalk. By carefully examining a field of tobacco, however, plants may be found on which practically all the leaves reach maturity at the same time. This is a very desirable characteristic, as it greatly facilitates harvesting, and is conducive to uniformity in the cured product. If such plants exhibit other desirable habits, they should be selected for seed purposes.

The colour of the growing leaf is also a point which requires consideration in the selection of seed plants, for it is often an index to the colour when cured. Most growers are familiar with the fact that leaf which takes on a greenish-yellow colour as it ripens can be easily cured a bright colour in the flue barn, but that leaf which has a dark green, oily appearance in the field usually cures out a dark and uneven colour. For this reason, only plants which shew a decided tendency to yellow in the field should be selected for seed purposes, if the grower desires to produce bright yellow leaf, and it is this grade which is in the greatest demand. If, on the other hand, the grower desires to produce leaf suitable for pipe tobacco, the plants selected for seed should bear dark green leaves which only shew flecks of yellow when ripe, and the leaf should be heavy in texture.

It is advisable that every grower should select double the number of plants which he expects to require for seed purposes. As the selection

Plate V.—Plants grown from (1) heavy, (2) medium and (3) light seed. (U.S. Department of Agriculture.)

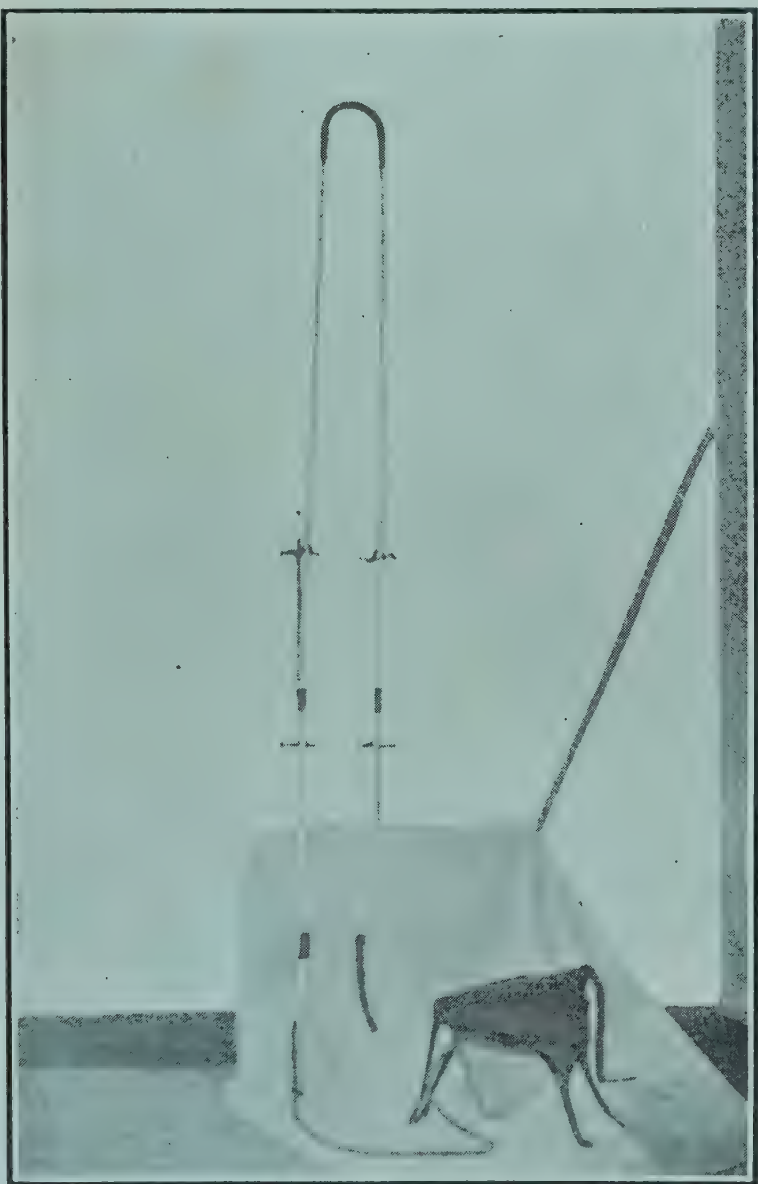

Plate VI.—Apparatus for cleaning and grading tobacco seed. (From Bulletin No. 2 of 1918, Union of South Africa Department of Agriculture.)

Plate VII.—Field of tobacco grown from heavy seed produced by selected acclimatised plants. Note the unformity in size and maturity of the plants.

must be made some time before the plants are ripe, it is often found that some of the plants must be discarded, as they develop undesirable characteristics when approaching maturity. In general, it may be stated that about 20 plants are required to produce one pound of seed, so that each grower can calculate fairly accurately the number of seed plants which he will require for the next season's planting.

Although the careful selection of seed from ideal plants of acclimatised varieties is the basis of profitable tobacco culture, this important work will be of little use unless precautions are taken to prevent cross-pollination between different varieties or between desirable and undesirable plants of the same variety.

Prevention of Cross-pollination.—The flower of the tobacco plant is, botanically speaking, perfect, as it contains all of the organs essential for reproduction, and is therefore naturally capable of self-fertilisation. This provision of nature enables the grower to obtain tobacco seed which is known to be entirely the fruit of the selected plant, and therefore capable of transmitting the desirable characteristics of the parent.

The method of preventing cross-fertilisation is both effective and simple, and is carried out by inverting a 14 lb. paper bag over the flower head and tying same loosely around the stem of the plant (see Plate IV.). The bag should be placed in position just before the flowers open, and should any flowers have opened before the bag is applied, they should be removed. In preparing the flower head for the reception of the paper bag, all of the top leaves and sucker branches should be removed, and only the three or four terminal flower branches be allowed to remain for maturing seed. The number of leaves to be left on the seed plant corresponds with the number left when topping the main crop, which is usually from 12 to 18, depending on the vigour of the individual plants. As soon as the plant is pruned, the bag should be inverted over the flower head, and held loosely in place by a soft string. The flower head should be examined weekly thereafter, when the bag is removed, and any suckers and surplus flower branches are pruned away and the dry corollas (petals) are removed. Usually when 70 to 80 capsules have formed, the remainder of the flowers are pruned away and the bag removed. After removing the bag, the plant should be visited periodically, to remove any buds or flowers which may develop later. In each well-developed seed capsule there are about 5,000 seeds, so that each seed head of 70 capsules should produce about 350,000 seeds. Thus it can be seen that a few seed plants properly cared for will produce sufficient seed for a large area of tobacco.

The seed heads should not be severed from the stalk until the pods begin to turn brown. The seed heads should then be removed and stored in a dry cool room where they will be safe from birds and mice. When the seed capsules are thoroughly dry, the seed should be shelled out, winnowed, carefully labelled and stored in glass jars covered with muslin. Before sowing, the seed should be passed through a tobacco seed grader to separate the light from the heavy seed, and only the heavy, well-developed seed should be used for seeding (see Plate V.). It is not expected that every grower will provide himself with this apparatus (see Plate VI.), and the Agricultural Department is, therefore,

prepared to undertake the grading of tobacco seed free of charge, the grower to pay carriage to and from Salisbury. Both experimental and practical results have definitely established the fact that heavy, well-developed seed produces greater yields of tobacco than light seed, and also produces leaf of better and more uniform quality.

Evidence in favour of Selecting and Grading Tobacco Seed.—Scherffius (2) states that "the plants from heavy seed were about ten days earlier than those from light ones, and a more even growth was had in the field after they had been transplanted. The crop from heavy seed gave 1,959 pounds of tobacco to the acre. The crop from light seed gave 1,644 pounds to the acre, shewing a difference of 315 pounds to the acre in favour of heavy seed."

Dr. Trabut (3) states that "the young plants from heavy seed were greener, more vigorous and of larger size. All of the plants were transplanted in the same field, alternating one plant from heavy and one plant from the light seed. All of the plants conserved their characters, but the plants from the heavy seed produced greener and wider leaves, and were more vigorous. The plants from the light seed developed slowly, and had a tendency to flower before sufficient development. The yield from the heavy seed was 12.5 kilograms, and the yield from the light seed was 6.4 kilograms." The above extracts from reliable writers should be sufficient to convince growers of the importance of using only heavy, well-developed seed for sowing.

The prepotency of self-fertilised selected plants in reproducing tobacco plants of like habit is well illustrated by Shamel (4). He states that "the number of leaves borne by parent plants selected from the Connecticut Sumatra variety was found to vary from 4 to 40. When plants with a small number of leaves were selected, it was found that their progeny produced on the average about the same number of leaves as the parents; and the progeny of plants having a large number of leaves was found to produce on the average about the same large number of leaves." In regard to the size of the leaf, the same writer states: "The size of the leaf, it has also been found, can be controlled by the selection of seed plants having the desired size. In the selection of Connecticut Sumatra tobacco, parent seed plants were saved having leaves 35 inches long by 22 inches wide, and in the same type other selections were made of plants having leaves 15 inches long and 7 inches wide. It was found that the crop produced from these selections possessed uniformly about the same size leaf as that selected in the parent plants. In all selections the size of leaf of parent plants was reproduced in marked degree in the crop grown from the seed of individual plants."

Experiments conducted by the writer in the Transvaal demonstrated conclusively that the yield from acclimatised seed was 30 per cent. greater than from imported tobacco seed of the same variety, and also that the quality of leaf from acclimatised seed was better in every respect.

One grower in Rhodesia has been practising seed selection for the past few years and has been very successful in producing acclimatised

seed especially suited to his local conditions. Last season, even with the unfavourable climatic conditions, his crop shewed great uniformity, and was of excellent quality. With the same climatic conditions, the crop in most parts of Rhodesia, grown from imported seed, was either a total or partial failure. The success of this grower is attributed more to careful seed selection than to any favourable conditions as regards soil or climate.

Extracts from various writers, illustrating the value of selecting tobacco seed plants, and of carefully grading the resultant seed, could be continued to great length, but the above should be sufficient to convince tobacco growers of Rhodesia that the practice of annually importing tobacco seed should be discontinued. The writer is convinced that no permanent improvement can be effected regarding the quality of Rhodesian tobacco until the growers practise systematic seed selection, and thus breed up the several varieties so that they are adapted to the local conditions of soil and climate.

It is hoped that this article may stimulate interest as regards the selection of tobacco seed by individual growers, and the writer will be pleased to assist as many growers as possible in making their selections.

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Wastage of Dip in Dipping Operations.

By J. M. SINCLAIR, M.R.C.V.S., Chief Veterinary Surgeon.

Owing to the high cost of cattle dip, the conservation of fluid by the use of adequate draining pens is a matter of pounds, shillings and pence, and, as it will probably be a long time before prices come down to pre-war rates, tank owners would be well advised to consider the draining arrangements at their tanks with a view to reducing wastage to a minimum.

The following observations made by the Department shew that proper draining accommodation means a saving of many pounds per annum :—

Tank.	Drainage.	No. of cattle.	Wastage in gallons.
1	Large single pen	1,250	480
2	Double pen	680	200
3	Race 34 feet	603	300
4	Race 30 feet	1,004	720
5	Race 60 feet	1,200	400
6	Race 60 feet	1,643	385
7	Race 72 feet	1,650	290
8	Race 72 feet	1,635	300

In considering these quantities, the size of the cattle must be taken into consideration. At tanks Nos. 1, 3 and 4, which are on or adjoining Salisbury commonage, dairy cattle predominate, and the number of small animals, *i.e.*, calves, yearlings and two-year-olds, will therefore be greater than in the average herd of farm cattle. The cattle at No. 2 tank are highly graded throughout, and the average size is considerably larger than in the average herd of farm cattle. At tanks Nos. 5 to 8 inclusive the animals are of the small Mashona type. The double draining pen and the long draining races are very economical; in the latter the wastage is governed largely by the speed at which the cattle are driven through. The single draining pen can be made as economical as any other plan, but only by a considerable wastage of time.

Gouda Cheese-making.

By JAMES B. FISHER, N.D.D.

Gouda cheese originated in South Holland, and takes its name from the city of Gouda. It is a type of cheese which should recommend itself to the small holder and the farmer who has only a small amount of milk at his disposal, say, anything from 4 up to 40 gallons per day. It is also made to a certain extent in factories. The standard English cheeses, such as Cheddar, Cheshire, etc., which require more milk to work on a payable basis, are too large for the average dairy farmer or small holder to make, as he does not usually have the necessary quantity. In addition, the utensils required for the larger cheeses are expensive, and the process of manufacture is difficult. Further, as it would not pay to employ skilled labour where small quantities of milk are being dealt with, the process must be simple, and such as any intelligent person can understand.

As in all branches of dairying, it is essential that the milk intended for cheese-making should be perfectly clean and in good condition, not sour. It is of no use attempting to make a good cheese with dirty or carelessly-handled milk, or milk produced or kept under insanitary conditions, as is too often the case where cows are milked in the open kraal, where the germ-laden mud or dust can gain access to the milking pail. Any dairy utensil that comes in contact with milk must be kept scrupulously clean, by washing first in luke-warm water, to which has been added a handful of washing soda, and secondly rinsing out in boiling water. On most farms will be found a suitable cheese-making room or hut, and almost any clean, airy and well-ventilated building having a good floor is suitable for this purpose. If a dairy has to be built, it should be of brick or stone, with a cement floor falling to a channel, which leads to a suitable gulley placed outside the dairy, and communicating with a proper drain. In the absence of a properly constructed curing room, it is necessary to obtain as cool a cheese-making room as possible.

A series of shelves on which to place the cheeses is necessary, and should be of some non-smelling wood, as clear pine or shelving boards. The number of shelves required depends on the output of cheese. The height between the shelves should be about 9 inches, to allow for an easy handling of the cheeses in turning, etc. The size of the cheese will be about 4 inches high and 10 inches in diameter. It is advisable to have the shelves well scrubbed before putting into use, and occasionally

when in use. For this purpose, permanganate of potash is used—a few crystals in water.

Utensils Required.—Where the output of cheese is more than can be used in the home—otherwise known as a trade amount—various utensils and appliances are necessary, such as cheese vat, cheese press, curd knives and various sized cheese moulds, etc., but where the cheese is only for home consumption, it is not necessary to buy an expensive outfit, nor is this outfit altogether responsible for the quality of the cheese produced.

For the home-making of cheese, an enamelled bath or bucket, free from any chips, is used in which to make the cheese. The bucket is put inside a slightly larger bucket; the space in between the two is called the "jacket," and serves to hold the hot water used in heating the milk. Cheese moulds are made in various sizes, to produce cheeses of different weights, and vary from 1 up to 30 lbs. The moulds are numbered ½ to 15, and twice the number on the mould denotes its capacity in pounds weight, viz., No. ½ will hold 1 lb. cheese, No. 4 will hold 8 lbs. cheese, etc. It may be mentioned here that 1 gallon milk will produce 1 lb. cheese.

The rennet and colouring matter, or annatto as the latter is called, should be of standard and well-known makes, such as Fullwood and Bland's, Hansen's, or van Hasselt's. Rennet can also be obtained in tabloid and powder form, but these forms should not be used where cheese is being made for sale, as tabloids are never reliable in strength. When purchasing liquid rennet, always apply for fresh, new stocks, as this is a liquid which loses its strength if kept too long. The same applies to the annatto. The two should always be kept in a cool, dark place. A good dairy thermometer is essential. Cheese cloth is also necessary, procurable from any draper, and should be cut into the sizes required, preferably into squares just large enough to cover the cheese neatly.

Making the Cheese.—Take clean, sweet milk which has been previously well strained and place in a bucket, enamelled for preference. Raise the temperature of this milk up to 84° F., by placing the bucket inside another containing hot water, and stirring the milk slowly till it is of the required temperature, viz., 84° F. Colouring matter, or annatto as it is called, is now added, at the rate of 1 dram to every 5 gallons of milk, and must be previously mixed with a little cold water before adding to the milk. One dram is equal to one teaspoonful of the liquid. This colouring matter is not necessary unless the cheese is for sale, as it has no effect on the making or ripening of the cheese; it gives to the cheese its red colour only. The rennet is next added, at the rate of one dram to every two gallons of milk, or sufficient to coagulate or thicken the milk in 25 to 30 minutes. If the coagulation takes longer, then this means that the rennet is weak in strength, therefore add slightly more. The rennet must be mixed with twelve times its volume of cold water, and then well stirred into the milk for three minutes. The milk is now allowed to settle till coagulation takes place, or the curd becomes firm enough to cut up. The degree of firmness can only be ascer-

tained by actual experience, but a good test is to place the palm of the hand on the curd round the edge of the bucket, and press it slightly down. If the curd is firm enough, it will not stick to the bucket, but come clean away, but, as mentioned, knowledge of this can only be gained by experience. The curd is now cut into small cubes about ½ inch in size with a table knife, or several knives tied together in a bunch. When this has been done, the temperature of the curd and whey is now brought up to 92-93° F. by again placing the bucket in another of hot water. The temperature must be gradually raised, and the curd stirred gently all the time; this period should take 30 to 35 minutes, that is, at the end of 35 minutes after cutting the temperature should be up to 92 or 93° F. The curd is now allowed to settle for three minutes, and the whey poured off, and the curd lifted out by hand into a wooden mould. This stage is reached when, on taking a small handful of the curd and squeezing gently into a lump, the whey is easily expelled, and on opening the hand the curd should not fall apart suddenly, but tear with a ragged edge on breaking open the lump. The size of mould required will depend on the amount of milk used. For four gallons of milk a mould to hold four pounds of cheese will be necessary. The mould must be well washed and scalded before using. After five minutes the cheese is reversed in the mould. This is best done by catching the side of the mould in the right hand, and on turning upside down, the cheese can be caught, or emptied out on to the flat of the left hand, and gently put back into the mould. Five minutes after the cheese is taken out again in the same manner, and, before putting back, the mould is lined with a piece of cheese cloth long enough to fold over the top of the cheese, which is now put back, reversed, in the mould.

The cheese is now put to press with only a slight pressure added at first. The whey emitted at this stage should be of a greenish hue, and not milky. If milky, then the pressure has been too sudden and too great. The amount of pressure would be one pound of weight for every one pound of curd or every gallon of milk used, increasing this gradually till at the end of twelve hours the pressure added is seven pounds weight for every pound of curd, viz., for four pounds of curd the total weight at twelve hours after pressing would be 28 pounds. This weight can be added by taking bricks of a known weight, and placing on top of the lid of the mould.

After the cheese has been under pressure for four hours, take it out and reverse in the mould and put back to press. This operation is repeated at the end of every four hours until the cheese has been in the press for twelve hours. At the end of this period the cheese is taken out of the mould, and the cloth taken off, and the cheese put back in the mould without the cloth, and without any further pressure. It remains like this for eight hours more, after which period it is salted. The salting process is as follows:—

Take the cheese and place on a table, or on the bottom side of the lid of the mould, and rub well with salt—top, bottom and sides—for about five minutes, and put back in the mould. This is done three times a day for three days for a cheese weighing six or seven pounds,

and for two days only for a smaller cheese. At the end of this period the cheese is taken out of the mould altogether, washed, dried and put on a clean wooden shelf in as cool a room as possible, and turned and wiped with a dry cloth every day till ripe. The ripening period generally takes from four to six weeks or longer, according to the weight of the cheese. After the cheese has been in the curing room for about a fortnight, it will begin to emit fat; especially is this the case where the curing room is kept at too high a temperature; the ideal temperature for a cheese-curing room is 55 to 56° F. When the fat begins to escape from the cheese, rub the cheese all over with boiled linseed oil; do this for two days. The oil tends to produce a nice soft skin or rind, and closes up the cracks, and also prevents excessive drying of the cheese.

Notice.

CATTLE CLEANSING ORDINANCE, 1918.

It is hereby notified that the "Champion" Arsenical Cattle Dip, in the dilution of one gallon of dip to 300 gallons of water, conforms to the standard strength laid down by the Cattle Cleansing Ordinance, 1918.

J. M. SINCLAIR,
Controller of Stock.

15th January, 1919.

Anthrax.

By C. R. Edmonds, Assistant Chief Veterinary Surgeon.

On 5th December last there was sent out from the Chief Veterinary Surgeon's office, Salisbury, the following circular:—

"ANTHRAX IN CATTLE.

"As there is some reason to believe that anthrax infection exists in the Territory to a greater extent than has been evident, the following is circulated for the information of Cattle Inspectors.

"Difference between Anthrax and Black Quarter.

"In black quarter the subcutaneous swellings crackle under pressure by the fingers owing to the pressure of gas within the tissues. Swelling in black quarter usually on shoulder or thigh, not so much about the neck and other parts of body. Blood of animals dead of quarter evil is normal, and the spleen is not as swollen or darkened as in anthrax.

"*General.*—As human beings readily contract anthrax, suspected cases should on no account be handled whilst alive, that is, more than is necessary for purposes of examination. After such examination the hands should be thoroughly disinfected. Suspected carcases should be burned intact after taking blood smears from ear or discharges. Where burning is not feasible, bury at least 6 feet deep, together with all discharges and excreta, and if possible place where beast died disinfected with a strong solution of dip or other available disinfectant and then fenced in. All in-contact cattle should be vaccinated.

"*Symptoms.*—The symptoms in cattle vary accordingly as the disease begins in the skin, lungs or intestines; they also depend on the severity of the attack. In the per-acute or apoplectiform type of the disease the temperature is high and breathing hurried. Death occurs very rapidly after the onset of the symptoms; in fact, in the majority of cases before the animal is noticed ill. This type usually occurs at the beginning of an outbreak.

"The second or acute type, without any external swellings, is that most commonly observed in cattle. There are the usual symptoms of fever, viz., high temperature, rapid breathing, fast pulse, muscular tremors, dry nose, ears, horns and extremities cold, coat staring, champing of jaws, kicking, pawing of the ground. As the disease progresses, the breathing becomes more laboured, the nostrils dilate, mouth may be open, and the visible mucous membranes become bluish in colour.

If the disease is localised in the bowels, there are symptoms of abdominal pain. The fæces, at first firm, become soft and covered with mucus and blood. Blood spots may be seen on the visible membranes, and bloody discharges from nose and rectum. Death ensues in one or two days.

"In the third or sub-acute form the symptoms are as in the acute form, but take two to seven days to develop. Local swellings appear externally, generally near the shoulder, head or neck, but may be found anywhere. They are at first hard and fixed, but later become cold, insensible and fluctuating.

"*Post-mortem Appearances.*—The carcase is swollen, blood is found round the nose and anus, the lungs and glands are congested, the spleen is very much enlarged, softer and darker in colour than normal, and its consistence resembles tar. Hæmorrhages may be found in any part of the body. The blood is of a tarry appearance, and does not coagulate. When cut into, the external swellings are seen to consist of a jelly-like mass of yellowish colour stained with blood."

Like many other official documents, the contents of this circular have become known to stock owners, and some of them, like Oliver Twist, "want more." I have felt it incumbent upon me to explain this matter, for the reason that it was, speaking from memory, before the *Rhodesia Agricultural Journal* came into existence that I wrote an article on anthrax which was read before the Farmers and Landowners' Association, Bulawayo. Since that date, a lot of water has toppled over the Victoria Falls, and others as well as myself have used an amount of ink on anthrax. Without this explanation, I might lay myself open to the accusation of possessing as great a desire to bring anthrax to the notice of people as some proprietors have of pushing their patent pills down people's throats; further, I would explain that if in the following notes readers find familiar paragraphs that they think they have read before, they will know the reason of this, also if my description of the disease does not quite correspond with that given in the circular, it will be due to my experience relating to the disease as it existed in Great Britain and not to South African experience.

History of the Disease in Rhodesia.—Anthrax is one of the live stock scourges that Rhodesia has suffered but little from. In 1898, some cases occurred amongst a herd of imported cattle quarantined near the Ramaquabane River. The next outbreak was in 1913, on a farm a few miles from Bulawayo, and during the last year or two a few outbreaks have taken place in Mashonaland, but during the last few months the outbreaks have been more frequent, causing stock owners to pay more attention to the disease.

Symptoms in Cattle.—The symptoms of the disease may perhaps be described best in half-a-dozen words: sudden death and rapid decomposition of carcase. Usually a beast infected only lives a few hours. I have seen an animal feeding, suddenly stop, give a bellow, and drop down dead. Of course, some animals live longer, and whilst there are not, so far as I am aware, any absolute diagnostic symptoms in the living animal, the poor brute has an anxious and distressed look, as if it recognised the seriousness of its plight.

Post-mortem Appearances.—The *post-mortem* appearances are pretty well marked. The first thing noticeable is that there is, I may say almost without exception, blood of a dark colour oozing out of the nostrils and from the anus, mixed with black coloured dung. Another most noticeable thing is the rapidity with which the carcase decomposes. Very shortly after death the body is swollen up to almost bursting point, due to putrefactive gases that have been evolved and escaped into the connective tissues under the skin, giving the carcase a drum-like appearance. Unfortunately there are other diseases in which death is sudden and decomposition rapid, such as quarter-evil and lightning, and under our system of farming and in our hot climate a beast that has been dead some time when found might present a similar appearance, therefore it would be necessary to go further with the examination. It is wrong in every way knowingly to open an anthrax carcase. Besides the great risk to the person opening the carcase, there is the danger of spreading infection to the soil and surroundings. But supposing, for the purpose of diagnosis, it is decided to open such a carcase, every precaution should be taken to prevent infection to the operator by seeing that he has no open sores or cuts and by a liberal use of disinfectant. On laying back the skin, the veins will be found very full of dark and imperfectly clotted blood. It will probably be quite liquid, and tarry in consistence. The existence of firm clots of blood in the veins almost amounts to reliable evidence that the disease is not anthrax. On opening the abdomen the enlargement of the spleen is the first thing to attract attention. This is, almost without exception, greatly enlarged, and when cut into the spleen pulp and blood runs out and resembles tar more than anything else.

Probably the best way for a farmer to obtain a reliable diagnosis of anthrax is to take a blood smear from the ear of the dead animal, and forward it for microscopical examination; but there are conditions that must be observed, the most important being that the animal has not been dead for more than twenty-four hours, otherwise the examination will be unreliable. Therefore he should state the number of hours the animal has been dead, where possible, or if he does not know, he should say so.

Symptoms in other Animals.—The symptoms and the appearances of the disease in sheep are similar to those in cattle. In the horse an *ante-mortem* symptom is frequently present in the form of a swelling of the throat, which rapidly (that is, in the course of a few hours), increases in size. The pig and the dog also shew a similar swelling, and the *post-mortem* appearances in these three animals to a great extent resemble those in the ox.

Anthrax is one of the oldest known diseases, and is thought to have been the sixth plague of Egypt. It attacks human beings as well as animals, and usually manifests itself in one of two forms. One is a malignant pustule on the hands, arms or face. People who work with carcases usually contract this form of disease. I have seen but one case of it in a slaughterman, and it was not at all pleasant to look at. The other form is known as "wool-sorter's disease," affecting the lungs, and, as the name implies, is contracted by inhaling the organism

with other dust during the handling of the wool from anthrax carcases. There is another form of the disease contracted by people eating the flesh of anthrax carcases. This is almost an impossible happening now in civilised countries, but here with our native population it is a different matter.

The question that is of paramount importance to the individual stock owner is the action he has to take to avoid getting the disease amongst his stock, or, if he gets it, the steps to take to stop its ravages. With regard to the former, he should endeavour to prevent its introduction to his property by means of animals, hides (including reims), skins, bones, manures, etc. With regard to the latter, besides the disposal of the carcases in the manner recommended and keeping the animals away from the known centres of infection on his land, he should inoculate, but personally I would never inoculate a beast of my own for anthrax until I actually had the disease upon my land.

Improvement of the Veld by Artificial Means.

By J. A. T. Walters, B.A., Assistant Agriculturist.

Rhodesia has a well-deserved reputation for raising cattle of good quality, but the carrying capacity of the veld is not equal to that of certain other countries, especially where the pastures have been improved by man. There is no reason why we should not emulate the example of older countries and attempt, by artificial means, to improve the feeding value of the veld so that more cattle per acre can be supported.

In order to do useful work in this direction, we must first seek to discover what are the factors limiting the carrying capacity of the veld generally or in special districts, and then proceed to investigate methods for improvement as practised elsewhere and adapt them to local conditions.

In my opinion, there are four characteristics which distinguish the Rhodesian veld and restrict its stock-carrying capacity as set out below:—

1. *The Prevalence of Sour Grasses.*—The word "sour" as applied to grasses is in common use in Rhodesia, and a sour grass may be defined as one that is fibrous in texture, wiry to the touch and not infrequently with an objectionable odour, as in the case of the turpentine grass. Sour grasses are consequently unpalatable to cattle and generally valueless as fodder except when quite young. One would not be far wrong in saying that about 75 per cent. of the grass in Mashonaland is sour, and this sourness is a characteristic of the fertile valley of Mazoe no less than of the poorer sand veld. In Matabeleland on the whole the grass would seem to be sweeter, and large patches of sweet feeding are to be found frequently along the water courses. The Gwelo commonage may be cited as an instance where the grass is mainly sweet.

As examples of the sweet grasses of the country may be mentioned rooi grass (*Anthistiria imberbis*), wild Timothy (*Setaria nigrirostris*), red-top (*Tricholœna rosea*), Dutchman's paspalum (*Panicum superbum*), quaking grass (*Eragrostis superba*), and buffalo grass (*Panicum sp.*). The first of these occurs in large patches in certain parts of the country, and is undoubtedly one of our best hay and pasture grasses. The other grasses spring up frequently in cultivated lands, but are found sparsely all over the country.

2. *The Scarcity of Edible Legumes.*—Another striking feature of our veld is its poverty in *edible* legumes. Other leguminous plants are plentiful enough. The common vaal bosch of Mashonaland (*Eriosema sp.*) is a legume, but cattle very seldom touch it, although it is said to be a food of the eland, and even donkeys are reported to browse on it. In the same way, the Gumba-Gumba plant (*Dolichos sp.*), is in full flower and foliage in early spring, but I have never seen it eaten off. Several leguminous trees—particularly of the acacia and bauhinia groups—provide nutritive food of great value to cattle, both in the form of pods and foliage. This is notably the case in Matabeleland, and native cattle in particular are not slow in availing themselves of this source of food. Imported cattle, however, seem to ignore these trees entirely.

3. *The Early Maturing Nature of the Grasses.*—It is a well-known fact that most of the Rhodesian grasses are in full flower not later than January or February. This is consequently the time when they are at their best for the purpose of hay-making. Later on, when the seed is fully matured, they have lost a great deal of their nutritive qualities, and, by the time the rains are quite over and hay-making is perfectly safe, they are of comparatively little value as fodder. On the high veld of the Transvaal and Free State it is frequently customary to start cutting the veld for hay as early as December, and this is sold at high prices as December-cut hay. The longer our grasses are allowed to stand after having flowered the poorer they are in value as fodder, and the less use they are for hay purposes.

4. *The Occurrence of a long Winter Drought.*—It is quite obvious

that during the long dry season in Rhodesia the ordinary shallow-rooted grasses could not survive, and the only plants that are able to maintain green growth are such as have bulbs or rhizomes for roots. This is the case with Napier fodder, Indian cane and cow cane. It is also a characteristic of the newly introduced Kikuyu grass, which succeeds in maintaining a good deal of greenness on account of its long succulent roots, which enable it to cover the ground so completely.

In certain countries plants such as salt bushes and aloes provide succulent food, which enables the cattle to tide over the winter successfully, but generally speaking Rhodesia is lacking in such plants, and where cattle are necessarily confined in fenced areas, the problem of keeping up condition during the winter is a serious one.

What then is the problem that confronts the Rhodesian farmer? It is this: That if he is anxious to run more cattle, or if he desires to produce milk and the best beef, he is obliged to improve or supplement the natural feed offered him by the Rhodesian veld, even when it is at its best. And it has been the aim and object of the Department of Agriculture for many years to attempt this improvement by discovering whether or not there are any native grasses which will repay the trouble of cultivation and propagation, and by introducing grasses, legumes and plants from other countries which will supply the deficiencies mentioned above. These problems may be enumerated as follows:—

Firstly.—Owing to the scarcity of edible legumes, we have to make up for the deficiency of proteins in our natural food. Grass alone, even when at its best, is not a complete food for cattle, and it is well known that the pastures of Europe consist of a high percentage of leguminous plants, such as clovers, which undoubtedly play a large part in the nutritive economy of the animal. In the Argentine, lucerne is grown so extensively that these pastures may be compared to those of Europe. In the same way in the Southern States of America, consistent attempts are being made to supplement the natural grazing by the introduction of all kinds of legumes. The lack of condition due to the absence of albuminous food is sufficiently well known to have acquired the name of "albumen starvation." Here in Rhodesia, unfortunately, lucerne will only grow under exceptional circumstances, while clovers of all kinds have consistently failed. Perhaps the only leguminous fodder plant which has given satisfaction as a possible constituent for pasture is the beggar weed (*Desmodium tortuosum*). The kudzu vine (*Pueraria thunbergiana*) is now being tried as a perennial somewhat resembling the velvet bean. Dhal has given much satisfaction where the cattle have been induced to eat it. The upshot is that the natural food provided by the veld must be supplemented in some other way and this has been successfully done by the production of such leguminous hays as velvet bean and ground nut tops, and of leguminous grains such as the dhal bean, cowpeas and ground nuts.

It will be profitable at this juncture to give the results obtained in a recent feeding test carried out in America. It was found that of 100 lbs. of maize feed alone and uncrushed to cattle only from 50 to 60 lbs. become available, the rest being voided as manure. When, how-

ever, 100 lbs. maize was fed with the necessary proportions of leguminous food, 80 lbs. were digested and retained by the animal. One other point in this connection may be mentioned. In this country, where ensilage is now so extensively made, the practice of including velvet beans, dhal tops and ground nut tops cannot be too highly recommended. The problem of providing proteins for his cattle is one that the Rhodesian farmer cannot afford to ignore, and on the solution of this will depend to a great extent the condition of his cattle through the winter months.

Secondly.—We have to provide a sufficiency of succulent food to counteract the dryness of the natural food during five or six months of the year. As has been stated above, the root system of the ordinary grass is unable to stand our winter conditions. Plants such as Napier fodder have the capacity of storing a certain amount of water in their roots. Other plants, such as prickly pear, are covered with a skin which prevents evaporation of any water. We must therefore look to these classes of plants to provide green pasture during the whole or part of our dry season. The success obtained with Napier fodder need not be emphasised; it is so valuable that no farm should be without it. It can be cut for ensilage or converted into hay as late as March or April, and the after-growth will provide green winter fodder from July onwards. When cut by frost, it sprouts up again as soon as the frosts are over. Other plants of the same type that have proved successful in Rhodesia are Indian cane and cow cane, while some of the native grasses, such as Guinea grass, can usefully be included in the list. On an ordinary farm it is essential that a small area be laid down for winter pasture, and the method of planting recommended is that which has been tried at the agricultural experiment station, Salisbury, viz., planting as many of the above kinds of grass as is possible in alternate rows, and including also occasional rows of legumes, such as dhal and beggar weed.

Up to this last season it might be said with truth that every attempt to establish a true pasture had failed. During this last year, however, Kikuyu grass (*Pennisetum longistylum*) has been experimented with, and seems to fulfil the conditions of an ideal pasture grass. Our experience with it is small, but in the Union it has been extensively tried. Perhaps the most extraordinary feature of all in this grass is its high percentage of protein. The analysis prepared by the Union Division of Chemistry shews Kikuyu grass to contain over 12 per cent. crude protein as against 15.5 per cent. in lucerne. No other known grass is so high in this respect. It is propagated from root slips, which are extremely hardy, and which ultimately spread to a good depth, forming a network of roots which materially help in retaining the moisture in the soil.

Thirdly.—The early maturing habit of the veld grasses makes the curing of good hay a difficult operation. As soon as a grass is fully grown, it immediately begins to flower and to form seeds. The nutritive juices are now being diverted to this one object, and much of the goodness of the plant goes into the seed. No great harm would be done by this if these seeds were digestible, but in the great majority

of cases they are not. Even teff and manna seed will pass undigested through the animal. If, therefore, our veld grasses are to be used to the best advantage as fodder, they must be cut as soon as they are in full flower. This occurs in almost every case in this country during December and January, and hay cut later than February has but little of its former nutriment in it. For this reason farmers sow annual crops, such as teff, manna or Sudan grass, as late as January, to be made into hay in April or May. The obvious disadvantage of this is that the process has to be repeated annually, and attempts have been made to discover a grass that would be both perennial and late maturing, and which would also give a heavy yield of nutritive fodder. In molasses grass (*Melinis minutiflora*) we have such a plant. This grass, a native of South America, is highly esteemed there on account of its feeding properties. It grows very slowly early in the season, and only comes into flower in May. This grass has been tried fairly extensively on the prevailing red soils of Mashonaland with good results. A trial cutting at the agricultural experiment station, Salisbury, last June gave over five tons of dried hay per acre. It stands drought remarkably well, but is touched by frost. Even when brown and dry it is relished by cattle. Being a perennial, it remains and spreads for many years, the only attention required being an occasional hoeing to keep down weeds. It is propagated readily both from seeds and from rooted slips, and seeds in small quantities for trial have been available during the present season. One or two of our native grasses have proved satisfactory from the point of late maturity, but as they do not spread in the same way as molasses grass, the yield is considerably inferior.

From what has been said about it, it is fairly obvious that there are ways and means of overcoming what are undoubted drawbacks in the Rhodesian veld as a cattle producer. Thus the lack of succulence in winter can be overcome by planting Napier fodder and other similar plants and by providing ensilage; the absence of legumes can be obviated by the growing of such perennials as beggar weed and dhal, or by the production of such annual hay and ensilage crops as velvet bean and ground nuts. A permanent hay crop of the first quality is provided by molasses grass, and it is more than probable that Kikuyu grass from British East Africa will prove the basis of a short pasturage in this country which will be of great value both for sheep and cattle. The course suggested for adoption by the farmer is that he should have a small paddock near his homestead laid down to a judicious mixture of grasses. Such a paddock will ensure a considerable quantity of nutritive material for winter use for his better-class animals and dairy cows, and will provide material for further propagation. The step from having a paddock to having a large acreage will not be a difficult one, and in many cases the laying down of exhausted maize land to Napier fodder will probably prove of great recuperative value; so that the time will come when, in spite of drawbacks, the farmer may be able to say that, through his own exertions, the part of Rhodesia that he possesses is undoubtedly great cattle country.

Obstruction in the Sheath of the Ox.

By J. M. SINCLAIR, M.R.C.V.S., Chief Veterinary Surgeon.

Cases of obstruction in the sheath of the ox have been reported from time to time, but during the months of November and December last an unusually large number occurred; in one herd over twenty animals were affected. As the condition may end fatally, and as it has been mistaken for snake-bite, the following notes will, it is hoped, be of assistance to stock owners in detecting and dealing with it. The fact that over twenty oxen in one herd were affected within a week or two would suggest that there was some specific cause at work. In previous years cases had occurred on this farm, and, the owner informs me, about the same time, viz., the beginning of the rains. It may be that the new grass causes an alteration in the composition of the urine, resulting in irritation and inflammation of the mucous membrane, which would naturally be followed by mechanical obstruction. Whether this is so or not the writer is not prepared to say, and any observation from stock owners as to the seasonal prevalence of the trouble will be much appreciated. Whatever contributory causes may exist, there is no doubt that the condition is the result mainly of the structure of the parts, and the comparative inactivity and arrested development following castration. The sheath has a very small external opening which is generally surrounded by a bunch of long stiff hairs; these may be a factor in the beginning by favouring the collection and deposits of various salts and other materials. Behind this orifice is a distinct pouch or cavity in which the material secreted by the various glands is liable to accumulate. In the ox the inactive and undeveloped penis is usually drawn back behind this pouch, consequently the urine is voided into it, and, unless completely expelled, rapidly undergoes decomposition, which, with the accumulation of the glandular secretion referred to, is the immediate cause of the condition. In the entire animal the constant protrusion of the enlarged penis serves to keep the passage clear and prevents such accumulation. Once the process begins, it rapidly progresses; intense inflammation followed by ulceration, and the accumulation of decomposed urine, pus and sebaceous material finally block the outlet. The swelling of the sheath in backward direction occurs, and eventually signs of internal pain shew that distension of the urinary bladder is taking place, which, if not promptly relieved, must end fatally.

The treatment depends on the stage at which the condition has arrived. If detected early, syringing out with warm soap suds may prevent further trouble. If further advanced and irrigation difficult or impossible, an incision should be made from the opening of the sheath

along the middle line, and the collection of matter removed by the fingers or a spoon; the cavity should be well syringed out daily with a warm solution of permanganate of potash or sulphate of zinc; of the latter 2 drachms to a gallon of water. Driving the animals through clean water of a sufficient depth will be of great assistance in promoting drainage.

Two Rhodesian Birds.

By Rev. Father Horn, S.J.

Very large flocks of the little red-billed Weaver Bird (*Quelea Quelea*) have been noticeable round Bulawayo during the past year. From what we hear of the failure of the crops of kaffir corn in many parts of Rhodesia, and of the depredations committed by birds, we may guess that this active little robber is very abundant at present throughout the colony. We have one stuffed specimen, evidently a hen, in the museum here, but its characteristic look has been somewhat marred by the substitution of yellow eyes for its own very bright black eyes, the pupils of which are bordered by a very narrow yellow circle.

To study the habits of these little miscreants more effectually I have had a pair of them—a cock and a hen—on my desk for the last three months. They are not very difficult to tame, and as a rule are free to leave their cage as they wish and fly about the room. A little calling was at first usually sufficient to bring them down from their favourite perch on the lamp-cord, and make them go back obediently into the cage. As they became more familiar and more independent, these obedient characteristics became somewhat modified. They began to object to being shut up at night, and refused to go to bed in the evening. I countered this insubordination by diminishing their food during the day and putting food into their cage at dusk. For two or three days this succeeded, but they soon saw through the plan. The hen went in, but the cock refused absolutely to enter while I was watching. I therefore shut the hen up, chased and caught the cock after dark, and put him to bed supperless. He shewed a most reprehensible temper during the process. He screamed at the top of his voice the whole time, and did his best to bite my finger with his very strong, thick beak. The following night they changed their tactics. One went in to eat while the other kept guard outside to give warning if I moved. They changed

places after a few minutes; so each got its supper without my being able to shut them up. This time I caught them both after dusk, pulled their beaks, boxed their ears and in other ways made myself disagreeable. I was not sure what the result would be. However, the treatment was successful. Next night, when I returned to my room at half-past five, they were both sitting in the cage, waiting for their supper, looking the picture of demure, injured innocence. Otherwise, I never feed them in the cage, but make them come out and eat their seed out of the palm of my hand. On other occasions I have a tin box standing on my desk, half filled with gravel, in which I bury various kinds of seeds. Their instinct for discovering where a seed is buried is remarkable, and their power of getting at it not less so. Their toes are unusually long, about an inch from the posterior to the fore tip, and are garnished with prodigiously long claws. Their method of scratching is to kick with both legs together, and the force they exert is surprising. They often jerk stones the size of a walnut for a distance of over a yard. In a minute or so they easily dig a hole two inches deep. When I see the rapidity with which they can unearth the seeds I have buried, I wonder how any seeds can possibly survive to germinate in fields frequented by these little robbers.

As pets they are very amusing, but excessively nervous. The slightest movement on my part sends them into a panic, but they are not afraid of sounds. I can talk to them or shout at them when they are feeding on my hand, and they pay no attention, but if I move my little finger ever so slightly they are off like a shot. They perch at night on the thinnest twigs they can find, and are not at all particular about their being horizontal; in fact, the vertical electric cord is their favourite resting-place.

The difference between the dispositions of the cock and the hen is very striking. When they are frightened, the cock flies about furiously, but the hen creeps into a corner or under the bed and hides. She is much fonder of her home than he is, but is less bold in going forth in search of adventure. Thus to come out of the open cage door on to my desk when I am sitting at it is always trying to their nerves. He invariably leads the way, and she always follows. But if while out I frighten them, she makes back into the cage, but he flies away. Otherwise, whatever he does she follows suit, with one other curious exception. She is always first on to my hand and remains there, steadily eating, while he indulges in various jumpy, nervous antics if I move or a paper rattles. Altogether, the contrast of masculine and feminine attributes in the pair forms an interesting study. He is restless, vivacious, straightforward and selfish; she is quiet, fond of home, patient and affectionate. In one curious physical attribute the female has the advantage. Her claws are more pliant and sensitive than those of her mate. This enables her to fly with a bit of cake on to a twig, and there hold it in her claws after the manner of a hawk and break it to pieces, a feat which I have never seen him attempt. If this superiority is universal in the female, I attribute it to some faculty which has been developed in the process of nest-building. At any rate the advantage which it gives to her in the struggle for food is very marked. She never relinquishes her hold on a morsel she has once secured. The cock has always to deposit his larger

chunks on the ground in order to break them, with the invariable result that they are snatched away by his thrifty mate, or by some other bird.

On the whole, however, the pair shew great mutual affection. If by any chance the cock flies out of the cage and I prevent the hen from following, there are evidences of great distress on both sides. She hops about excitedly inside, and he, now on top, now in front, now clinging to the netting, gives every evidence of being an anxious and solicitous husband. If, on the other hand, I manage to get him back into the cage while she is at large, the excitement is even more intense. She goes about chirping loudly—the only occasion on which I hear her voice—while he goes through the most frantic antics behind the wire netting. These admirable displays of mutual regard are somewhat marred by a persistent habit he has of digging his partner in the ribs with his beak whenever she gets in his way. Perhaps this is a sign of affection, but she does not seem to like it.

Such, as far as my observation goes, are the habits of the little red-billed weaver-birds. Friendly as I am with them at present, and sorry as I should be to see any harm befall them, I cannot be blind to the fact that seeds, whether underground or in the ear, would have very little chance of surviving on any land which large flocks of these birds frequented.

The great enemy of the weaver-birds and the great means provided by nature for keeping them down are the hawks, and especially the little Banded Goshawk (*Astur Polizonoides*). There is a specimen of this bird in the local museum, but again the eyes are not correct in colour. This goshawk has most beautiful large eyes with a brilliant orange-red iris. The eyes of the stuffed specimen are dull yellow. The museum notice, referring to the bird, says it feeds on insects and lizards. My own opinion is that it feeds almost exclusively on birds.

I had one of these hawks given me, which had been brought down by a lucky shot from a catapult. I quickly cured its wing, and, like most hawks, it was not difficult to tame. In a month it would fly down on to my hand from its high perch whenever I called it. It became so tame that I could bang its head, pull its beak, scratch its neck or breast while it stood on my hand, without its shewing any sign of alarm. Its chief objection was to going to bed at night, perhaps because I shut it up to prevent its disturbing me in the morning. No matter how obedient it had been in coming to my hand during the day, whenever I called it when dusk approached it would not come near me.

I have very little doubt that small birds form its chief natural article of diet. The number of small birds which at dusk kill themselves by flying against the telegraph wires provided plenty of food. The hawk's method of seizing a bird was almost invariably by the head. His strong nervous claws, which just encircled the skull of any small bird, held it fast, while the sharp pointed talons, automatically curving inwards, pierced the skull and neck, and would soon cause death. His method of eating a bird was quite methodical and uniform. He detached the talons of the right foot from the head, which was not done without difficulty, as the contracting powers of the claws were apparently much stronger than the muscles of expansion. He then grasped it firmly by

the neck, and began to pluck and eat the head. He pulled the skull to pieces and ate all the bone, and even the beak if it was not too large. The breast he hardly plucked at all, but ate feathers and all. When he came to the legs he tore them off entire and swallowed them, thighs first and claws last. Such is his strength that I have seen him plant his feet on the body of a small dove and tear the whole leg away with his beak. His method was to throw out both wings, and jerking them rapidly forward, while he threw his body backwards, to add greatly to his wrenching power.

His cleverness in catching birds was remarkable. He did his best to get at the weaver-birds which I had in their cage. I watched him manœuvring for some time. His first plan was to indulge in the most terrifying antics in front of the cage wires in the hope that one of the inmates in its excitement would fly within reach of his deadly claws. The small birds frustrated this plan by cowering in the furthest corner. He then hid behind the boarding of the cage, peeping round the corner now and then at his intended prey. His efforts failed, chiefly because I was there to see that no murder was committed. He had better luck once when I was out. He had evidently frightened a golden oriole, which was quite safe in a deep cage, into fluttering within reach of his claws and had then seized it. He had managed to drag it between the bars of the cage and had already eaten its head when I entered the room. He slunk under my bed with a look of conscious guilt as soon as he saw me, which I took to be a sign of his bad conscience and of his intelligence. This was the only occasion on which I knew him to hide.

In spite of his large expanse of wing, the flight of this hawk is wonderfully soft. I often looked up at his perch above my head and found that he had gone without making the slightest sound. The weaver-birds are audible, on the other hand, if they fly a yard. Like most hawks, the bird was very intelligent. I have suspicions that to avoid the unpleasant operation of being caught and put to bed he mounted on his own chosen resting-place, and with his head buried beneath his wing, feigned deep slumber, in the hope that he would be left undisturbed. On one occasion I was teasing him by holding some meat in the closed fist of my left hand, while he stood on my right wrist. After one or two attempts to thrust his head between my fingers, he poised himself on his right leg, and, leaning forward, tapped my fist gently three times with his extended right claw. He did it exactly as a child might pretend to slap a person for not giving it what it wanted.

I hear that this hawk is shot without mercy owing to his reputation for killing chickens, a reputation which in places I have no doubt he deserves. In the economy of nature, however, I have no doubt he does more good than harm. Two or three hawks on a farm may walk off with two or three chickens in a year, but on the other hand they may save a whole field of grain. I am quite sure that there can be no better scarecrow than a hawk hovering overhead. I believe that the banded goshawk would be capable of accounting for one small bird a day, and it is highly probable that without some such assistance the work of keeping the number of destructive small birds within bounds would be insurmountable.

The Tampan or Poultry Tick.

By ARTHUR LITTLE, Poultry Expert.

This is undoubtedly the worst "insect" pest among poultry that we have in Rhodesia, indeed in South Africa, and considering the great importance the poultry industry is to a country, a description of this tick (or to give it the name by which it is usually known in South Africa, "the tampan") and the best methods of destroying it is very necessary.

Many people keeping poultry are unaware that these ticks are present in their houses. During the day they can easily be detected by pushing the blade of a knife into any cracks in the wood, etc., when, if ticks are present, blood is seen on the blade. During the night the ticks emerge, and can be seen crawling on the sides or roof of the house and on the perches and birds.

There is not much doubt that this tick was introduced into South Africa from India. It is also found in Australia and New Zealand, into which countries some say it was introduced from South Africa. It is unknown in Great Britain and cold, damp climates, but it thrives and multiplies rapidly in both hot, dry countries and cold, dry ones. This tick belongs to the order acari, the genus argas, and is technically known as *Argas Persicus.* In shape it is usually oval, flat and with a distinct margin round it. It is of a bluish brown colour, with eight legs in its adult form. It has no eyes; nevertheless it can distinguish light from dark, and feeds only on the birds at night, retiring during the day time to crevices and cracks. The adult form is never found on the birds in the day time.

The Life Cycle of the Tick.—The adult female lays small quantities of eggs, usually in a crack or crevice, in numbers varying from 15 to 80, at the rate of several a minute. These hatch out and we have the larva, a little bigger than a pin's head, of a grey, translucent colour, with six legs It is round in shape, and its small size is often the cause of its non-detection. Some reach the fowls by walking with the gait of an ordinary spider, others are carried to the birds attached to adult ticks. The larvæ feed day and night for about ten days without leaving the birds, at the end of which period they have the appearance of blue-black "insects." As they become engorged with blood, they change their shape from circular to oval; they then leave the fowl, hide in a crack or crevice, remain dormant and digest their meal. At the end of about a fortnight or three weeks of this dormant stage, they moult, grow a

fourth pair of legs, and become what are known as nymphs, of which there are two stages. They emerge, feed at night only, and for about two hours only. Again they retire, lie dormant and moult. The same procedure is gone through in the second stage of the nymph, and they finally develop into the adult tick, the eggs are again laid, and the cycle again performed.

The tick can live for very long periods without food; some say as long as two years. I have kept them a year in a corked bottle, and when taken out and placed in the sun they soon began to move. At the end of this period they were much shrunken, but still alive, and this accounts for the fact that if birds are put into a house that harboured ticks and that has been empty for eighteen months or two years, they will, immediately it is dark, be attacked by the ticks, which by some means acquire a knowledge that their prey is near.

Methods of Infection.—An adult tick will travel long distances along fences or trees, and gradually pass from poultry house to poultry house, and this is one of the common methods of their spread in the suburbs of towns. Another common source of infection from one part of the country to another is by tick-infested coops, sacking, crates, etc.; another by fowls, with the larvæ on them, sent from one place to another. In Australia it is prohibited by law to allow these ticks to infest any houses, birds, trees, etc., or to sell poultry so infested or even from infested premises. Such fowls, crates, etc., found so infested are at once destroyed, and the owner fined not less than £5 and not more than £100.

Cause of Death is Tick Fever.—Fowls, turkeys, pigeons and some wild birds are subject to the disease caused by fowl ticks, but more especially fowls, as the other birds are more restless at night. The cause of death is not due, as the majority of persons think, to weakness caused by loss of blood, although the loss of blood does weaken the bird and lowers its vitality. The tick is the host of an organism called the Spirochæte, which, when the blood is being sucked, passes into the system of the fowl, causing tick fever, the symptoms of which are prostration, high temperature, loss of appetite, thirst, ruffled feathers and slight diarrhœa of a greenish yellow colour. If the bird is treated at once by destroying the ticks, *i.e.*, the larvæ, by dipping the fowl in a solution of hot water and 5 per cent. paraffin and soap suds, or a solution of hot water and 10 per cent. Jeyes' Fluid or similar disinfectant, and removing to clean quarters, the bird will probably recover, but as a rule the disease has taken such a strong hold, and there are so many organisms in the blood, that there is little hope of recovery. However, there are cases of the bird having had the disease and recovering, and such a bird becomes immune. One frequently finds birds well and in good health, although not as productive as they would otherwise be, in houses infested with fowl ticks; but introduce other birds that are not so infected, and they immediately sicken and usually die. One often hears the remark, "I bought birds [it may be pure-bred or otherwise] from so and so, and soon after I had them they sickened and died, while my own original birds were quite healthy." The reason is obvious, and for the same reason pure-bred birds are considered by many poultry keepers as being of a delicate constitution.

Methods of Destroying the Tick.—System, perseverance and patience are necessary to get rid of this pest. Some recommend burning tick-infested houses. This is rather an expensive method, if the house is of wood or brick; if of grass or straw or similar material, the loss is not great, and this procedure is recommended. If of iron (and, contrary to the usual idea, an iron house will harbour ticks under the overlapping sheets and similar hiding places), a quantity of straw can be placed inside and fired and the house made as hot as possible. In the case of brick or wooden houses, the best method is to use first a plumber's blow lamp, and direct the flame into all the cracks and crevices, then spray well into these a 20 per cent. solution of water, as hot as possible, and Jeyes' Fluid or similar disinfectant, or a similar solution of paraffin and soap suds. The same night put several birds into the house and go after dark with a light, and if any ticks are noticed, repeat both operations next day and each day until no ticks are discovered after dark. Coops, crates, nest-boxes, perches, etc., should be immersed for several days in a dipping tank or solutions as given for spraying. All trees infested should be cut down, and fences, etc., removed. The ground on which the houses stand should be saturated with paraffin.

Other disinfectants that can be used, although more expensive than the above, are:—

A 10 per cent. solution of carbolic acid, but great care must be, of course, used when employing this.

A 20 per cent. solution of lysol.

A 20 per cent. solution of milk oil fluid.

A 10 per cent. solution of caustic potash or soda. Care is required too in using this.

Preventative Measures.—Wood for wooden houses should be well painted before construction with solignum, carbolineum or similar preparation. All houses should be sprayed every fortnight in hot weather and every month in cooler, and the spray forced well into the cracks or between any materials that overlap. All perches, nest-boxes, etc., should be movable. Strict cleanliness is a *sine qua non.* All new arrivals should be at once dipped, and all birds dipped at least once a month. Coops, crates, etc., arriving from other quarters should be immersed in disinfectant solution for several days.

Nearest neighbours should be urged to follow these precautions.

Keep the birds strong, healthy and vigorous, and not over-fat. The reverse of this condition lowers their vitality, and causes them to be more susceptible to the attacks of ticks. As long as ticks are present, it is unsafe to keep poultry, and the financial loss is often great; certainly it spells the difference between profit and loss. If each farmer and poultry keeper would do his share to eradicate the tampan from his premises, we should soon see a vast improvement in the quantity and condition of the poultry of the country.

Descriptive List of Forest Trees and Ornamental Shrubs

GROWN AT THE GOVERNMENT FOREST NURSERY, SALISBURY.

The following list of trees and shrubs includes all the different kinds grown at the Government forest nursery, Salisbury. Seedlings or slips of these can be obtained during the season, and are sold to the public at low rates. Prices and conditions of sale are published in the *Agricultural Journal* from time to time as the plants are ready during the season. Persons desiring to order trees or shrubs should consult the current list of *available* transplants to be found among Departmental Notices in the latest issue of the *Journal*. Plants that have failed or proved unsatisfactory are not included in the subjoined list.

Botanical Name.	Common Name.	Remarks.
Abutilon	Chinese Lantern	Shrub, height 8 ft.; orange coloured flowers; requires pruning heavily after about the fourth year.
Abutilon	Chinese Lantern	Variegated variety; very pretty foliage.
Acacia cultriformis	Wattle	Small ornamental tree, height 10 ft.; sweet-scented yellow flowers; hardy to drought and frost.
Acalypha		Pretty foliaged shrub with variegated leaves; cannot stand frost.
Alamanda nerifolia		Small compact shrub, with bright yellow flowers and pretty foliage; height 4 ft.

Botanical Name.	Common Name.	Remarks.
Aloysia citriodora	Lemon-scented Verbena	Shrub, height 5 ft.; very sweet-scented foliage.
Althea	Christmas Rose	Shrub similar to hibiscus, height 5 ft.; colour of flowers white and mauve, in single and double varieties.
Anona reticulata	Custard Apple	Fruits fairly readily, but cannot stand much frost.
Antigonon leptopus		Vigorous pink flowered creeper; dark foliage.
Aristolochia sypho.	Dutchman's Pipe Creeper ...	Rank growing creeper; curiously shaped flowers.
Bauhinia		Indigenous to Rhodesia; medium sized trees up to 25 ft. high; flower profusely in early spring; white and mauve varieties.
Bauhinia Galpini		Indigenous to Rhodesia; small tree, which prefers to ramble up other trees, and under favourable circumstances will reach a height of 20 ft.; very pretty red flowers, which last for several months.
Beaumontia		Very pretty large climber, with heavy glossy foliage; large white bell-shaped flowers; blooms profusely.
Bignonia venusta	Golden Shower	Very showy quick-growing creeper, bearing masses of flowers all the year round.
Bougainvillea		Very handsome large shrub or climber; may also be used for hedges, when it can be very neatly clipped; flowers profusely.
Brachychiton acerifolius ...	East Australian Flame Tree	Handsome evergreen shade tree; brilliant crimson flowers; can withstand drought.
Brunsfelsia eximia	Natal Violet Tree	Very pretty small shrub bearing sweet-scented flowers, coloured blue, pink and white, owing to their fading with exposure to the sun; height 4 ft.
Brunsfelsia americana ...		White flowers, larger than brunsfelsia eximia.
Buddleia, blue		Large shrub, height 8 ft.; very pretty sweet-scented flowers; makes a good hedge; very easily grown from cuttings.
Buddleia, yellow		Rank growing shrub, height 12 ft.; would make a good quick-growing wind break.

Callitris calcarata	Cypress Pine	Very hardy tree not attacked by white ants; yields excellent timber not eaten by borers or ants; prefers rich soil, and can stand quite a lot of heat.
Callitris robusta	Murray Pine	Hardier than Cal. calcarata, and is particularly suitable for planting on ironstone kopjes.
Callitris Whytei	Blantyre Cedar	Indigenous to Rhodesia, but only as a small tree; requires an altitude of 9,000 ft. to grow into large timber.
Callistemon	Bottle Brush	Scarlet flowering shrub of drooping habit, height 12 ft.; makes an excellent hedge if trimmed along the top only.
Cassia	Cape Laburnum	Quick-growing shrub, bearing masses of bright yellow flowers, height 8 ft.; several varieties of cassia are indigenous to Rhodesia, and are very conspicuous in the veld with their bright yellow flowers; many new varieties are being tried here.
Casuarina leptoclado	Beefwood	Fine large quick-growing tree, suitable for wind-breaks for cattle; should be planted in single or double rows 15 to 20 ft. apart; fails as a plantation tree; not suitable for garden or orchard wind-breaks on account of its spreading roots.
Cedrela toona		Large quick-growing deciduous trees with handsome foliage; very suitable for avenues; not troubled by white ants; valuable soft timber, which is heavily scented.
Cereus grandiflora	Queen of the Night	Climbing cactus; very suitable for climbing up native trees in gardens; very large sweet-scented yellow flowers, which open at night.
Cestrum aurantiacum ...		Shrub with pretty yellow flowers. height 6 ft.
Cinnamonum camphora ...	Camphor	Very handsome evergreen tree; slow growing; requires fairly good rainfall.
Clitoria ternata	Mussel Shell Creeper	Slender creeper, bearing very pretty porcelain blue flowers; thrives best under semi-tropical conditions.

Botanical Name.	Common Name.	Remarks.
Cratægus pyracantha	Hawthorn	Evergreen shrub, height 15 ft.; makes a very strong thorny hedge.
Croton sylvaticus		Large-leaved deciduous tree from the Melsetter forest; makes a very handsome tree under favourable conditions.
Cupressus arizonica		A very hardy evergreen tree, suitable to the very dry parts of the country; makes an excellent hedge if planted closely.
Cupressus funebris	Weeping Cypress	Very ornamental; slow growing.
Cupressus lusitanica	Portuguese Cypress	A quick-growing cypress, producing excellent timber; requires a good rainfall; very suitable for hedges.
Cupressus torulosa	Himalayan Cypress	A hardy evergreen tree, very suitable for orchard wind-breaks; excellent timber not troubled by borers; one of the best trees for timber plantations here in situations where it thrives; will usually do well on very poor soil; a very straight, handsome tree; fairly quick-growing.
Cyphomandra betacea	Tree Tomato	Height 8 ft., bearing edible fruits.
Dalbergia sissoo		Excellent timber tree; deciduous; will probably thrive best on granite vlei soil.
Dentzia	Bridal Wreath	Deciduous shrub, height 5 ft.; pretty white flowers.
Dodonea viscosa		A good hedge plant, growing very well on red soil; indigenous; evergreen.
Dombeya	Rhodesian Mallow	Indigenous shrub, height 10 ft.; pretty pink flowers in autumn.
Duranta		Indigenous shrub, height 10 ft.; pretty blue flowers; makes a good thorny hedge; deciduous; also a white flowering variety.
Eucalyptus amygdalina	Peppermint Gum	Quick-growing; requires fairly good conditions.
Eucalyptus botryoides		A handsome tree, with plenty of foliage and very quick growing; somewhat similar to E. saligna, but never attains to such a large size, and the wood is slightly inferior.
Eucalyptus calophylla	White Flowering Gum	Very pretty when in flower; requires good conditions; medium sized tree; no timber value.

Eucalyptus citriodora	Lemon-scented Gum	Good quick-growing timber tree; can endure much more tropical heat than most gums, but it is rather susceptible to frost; will usually resist white ants; always a favourite on account of its clean appearance and scented foliage; fairly hardy; seedlings are not very vigorous, and consequently rather difficult to transplant.
Eucalyptus crebra	Ironbark	Slow growing; stands drought and light frost; first-class timber.
Eucalyptus maculata	Spotted Gum	Excellent quick-growing timber tree; requires moist, sub-tropical conditions; imported timber of this tree is largely used throughout Rhodesia for wagon building, under the name of Australian hickory.
Eucalyptus melliodora ...	Grey Box Gum	Very hardy; rather slow-growing; suitable to the very dry and cold parts of the country.
Eucalyptus microcorys ...	Tallow Wood	First-class timber; slow-growing; requires good rainfall.
Eucalyptus microtheca ...	Coolibah Gum	Will stand extreme heat and drought and also fairly severe cold; rather slow growing; medium sized tree.
Eucalyptus paniculata ...	Ironbark	Produces the best hard durable timber of all the eucalypts; should be extensively tried in well-drained situations fairly free from frost; will grow on dry and shallow soils, but the best timber results will be obtained where the soil is deep; fairly quick growing in favourable situations.
Eucalyptus robusta	Swamp Mahogany	A large-leaved gum, requiring rather a moist situation, but occasionally doing well on high ground; makes a very quick start, but is extremely liable to be eaten by white ants if not in a suitable situation; the branches of large trees are continually breaking off, and give the tree a very ragged appearance.
Eucalyptus rostrata	Red Gum	Good, hard, durable timber; quick growing and hardy; particularly suitable for shallow red soils where other quick-growing gums will not thrive; lasts well in the ground as a rough pole; does not thrive on poor, shallow, granite soils or in the extremely dry parts of the country.

Botanical Name.	Common Name.	Remarks.
Eucalyptus saligna		This gum requires good deep soil; prefers the granite formation and thrives best in low lying situations where the soil is rich and deep and the roots can get down to sub-soil moisture, but it will grow well under any ordinary good conditions; it is a very handsome tree with plenty of foliage, very quick growing and remarkably straight; it provides excellent poles for general purposes, but they do not last well in the ground; it will not thrive on hard, shallow soils or in the very dry parts of the country; where this tree thrives it may be said to be the best gum for ordinary purposes in Rhodesia.
Eucalyptus siderophloia ...	Broad-leaved Ironbark	Timber hard and durable; worth trying in the wetter parts of the country; will not stand much frost.
Euphorbia jacquinaflora ...		Small shrub, height 4 ft.; very handsome scarlet flowers in very early spring; will not stand much frost.
Gardenia	Katjepeering	Compact evergreen shrub, height 4 ft.; very pretty sweet-scented white flowers; also an indigenous variety with pretty white flowers, height 10 ft.
Genista	Broom	Yellow flowering shrub, height 8 ft.
Grevillea robusta	Silky Oak	A handsome ornamental timber tree; orange-coloured flowers; pretty foliage; yields a handsome furniture wood which is elastic, durable and fairly easily worked; rather rapid growth; drought resistant.
Habrothamnos		Hardy shrub, bearing large bunches of trumpet-shaped red flowers; height 5 ft.
Hedera helix	Ivy	Dark evergreen climber; will grow freely up native trees.
Heliotropium	Heliotrope	Sweet-scented shrub, height 3 ft.
Hibiscus		Bright scarlet flowering shrub, height 8 ft.; single and double varieties.

Holmskioldia		Handsome flowering shrub, height 8 ft.; red and yellow varieties; flowers freely during autumn and winter; makes a good hedge if clipped once a year only after flowering.
Hypericum	St. John's Wurt	Pretty yellow flowering shrub, height 4 ft.; also indigenous varieties up to 8 ft.
Iochroma		Pretty flowering shrub, height 8 ft.; dark blue, mauve and scarlet varieties.
Jacaranda mimosæfolia	Jacaranda	Very hardy ornamental tree; deciduous; not troubled by white ants; gorgeous blue flowers in spring; very suitable for street tree planting.
Jasminum nudiflorum	Cape Jasmine	Hardy yellow flowering shrub, height 10 ft.
Jasminum	Climbing Jasmine	Hardy climbers; yellow and sweet-scented white varieties.
Jasminum sambac		Large bush, or may be used as a climber; bears large trusses of very fragrant white flowers.
Lagerstrœmia	Indian Crepe	Hardy ornamental shrub, height 10 ft.; mauve, pink and white varieties.
Lagunaria patersoni		Handsome tree with large purple flowers; grows fairly well in dry situations.
Lantana		Rank growing shrub, height 8 ft.; white flowers; makes a good rough hedge; rather strongly scented; the orange-coloured variety is very liable to become a very troublesome weed, as it grows very readily from self-sown seed.
Lasiandra		Very handsome indigenous shrub, height 6 ft.; gorgeous purple flowers.
Liriodendron tulipifera	Tulip Tree	Very handsome deciduous tree suitable to moist, cool situations.
Lonicera	Honeysuckle	Hardy climber; red or sweet-scented white varieties.
Mandevilla suaveolens		A beautiful deciduous slender climber, bearing white trumpet-shaped flowers; very fragrant.
Michelia champaca		Handsome, heavy-foliaged tree, bearing very sweet-scented yellow flowers.

Botanical Name.	Common Name.	Remarks.
Murraya exotica		Hardy, compact, evergreen shrub, height 6 ft.; sweet-scented small white flowers; makes a perfect clipped hedge; slow-growing and difficult to strike from cuttings.
Nerium	Oleander	Hardy evergreen shrub, height 10 ft.; red, double pink and white varieties; rather liable to be attacked by scale.
Passiflora edulis	Granadilla	Quick-growing climber, bearing edible fruits (purple colour).
Passiflora	Fiji Granadilla	A large-leaved variety, bearing yellow fruits; requires moisture.
Philadelphus	Mock Orange	Pretty white flowering shrub, height 6 ft.
Photinia eriobotrya	Loquat	Hardy evergreen tree, suitable for avenues and orchard wind-breaks.
Pittosporum undulatum	Camphor Laurel	Hardy evergreen shrub, height 8 ft.; sweet-scented inconspicuous flowers; makes an excellent clipped hedge.
Platanus orientalis	Plane Tree	Very ornamental foliage; deciduous; new introduction promising rather well.
Plumbago capensis	Plumbago	Very hardy shrub, height 3 ft.; pretty bright blue flowers; makes a beautiful low hedge.
Plumíeria	Frangipane	Very handsome flowering shrub, height 8 ft.; white and pink varieties.
Podranea	Zimbabwe Creeper	Rank growing indigenous creeper, flowering profusely in autumn; very pretty large pink flowers.
Poinceanea regia	Flamboyant	Very ornamental deciduous tree; graceful foliage; gorgeous scarlet flowers; requires good rainfall to flower profusely; very suitable for street tree planting where conditions are favourable.
Poinsettia		Very showy shrub, height 8 ft.; red, double red and yellow varieties; very hardy and easily grown from cuttings, but liable to be cut by frost.
Populus alba	White Poplar	Excellent soft timber; requires moist, cool situation.
Psidium pomiferum	Guava	Small, hardy tree, height 10 ft.
Punica granatum	Pomegranate	Makes an excellent hedge plant; bright scarlet flowers.

Rosa bracteata	Macartney Rose	Very pretty dark evergreen foliage; flowers profusely in very early spring, bearing single white blooms; a good thorny hedge plant.
Russellia juncea	Coral Fuchsia	Pretty shrub, height 3 ft.; tubular coral red flowers.
Salix babylonica	Weeping Willow	Very ornamental deciduous tree; will only succeed near water.
Salvia		Very hardy free-flowering shrubby plants, height 3 ft.; mauve and pink varieties; there are many pretty annual varieties.
Schinus molle	Pepper Tree	Thrives well in very dry country; very ornamental and suitable for street tree planting; prefers sandy soil.
Securidaca longipedunculata	Rhodesian Violet Tree	Small tree up to 25 ft. high, bearing a gorgeous show of light violet-coloured flowers, very sweet-scented.
Solanum wenlandii	Potato Creeper	Very hardy quick-growing creeper; bright blue flowers.
Spathodea campanulata ...		Very handsome heavy-foliaged tree, bearing bright red flowers; requires good rainfall.
Spirea	Cape May	Very hardy white flowering shrub, height 4 ft.; makes a good hedge.
Streptosolon jamesonii ...		Very handsome flowering shrub, height 3 ft.; flowers profusely in very early spring.
Tecoma capensis	Kaffir Honeysuckle	Very hardy shrub, height 6 ft.; bright orange-coloured flowers; makes a good hedge.
Tecoma smithii		Very hardy shrub, height 10 ft.; bright yellow flowers; makes a good rough hedge.
Thevetia nerifolia		Hardy shrub, with graceful foliage, bearing bright yellow flowers; height 6 ft.
Thuya orientalis	Arbor Vitæ	Very hardy small evergreen tree; slow growing; makes a good hedge if planted close and kept well clipped; may be grown as a garden border and only allowed to grow a few inches high.
Tristanea conferta		Good avenue and timber tree. A new introduction promising fairly well; similar to eucalyptus tree in appearance.
Wistaria chinensis		Rather slow-growing climber, bearing beautiful trusses of pendant blue flowers.

Emmer.

PLOT EXPERIMENTS ON BULAWAYO MUNICIPAL FARM.

The following interesting and valuable information has been furnished by Mr. Chas. M. McClellan, manager of the municipal farm, Bulawayo. The data are not sent in such shape that they can be shewn in tables of yields, weight of grain, straw and hay, but are more of the nature of observations of growth, hardiness, the forage and grain qualities of emmer. The land chosen for the experiments was of poor granite sand, all under irrigation.

Mr. McClellan in his report says:—"For a winter green fodder crop I have never seen its equal, growth being extremely vigorous, and a much heavier cropper than barley, and more palatable. None of the emmer plots were in ear when cut, but the barley was in full ear at each cutting. No advantage was found in allowing the crop to mature without cutting or grazing; in fact, better results were obtained by cutting once or twice and having the benefit of the green food." Mr. McClellan advises the old method of sowing—sow first and plough in, then harrow; distance of rows 18 inches apart.

Plot 1.—Sown on the 23rd March; irrigated; previous crop beans; a heavy dressing of good clean stable manure was given; although only a moderate amount of seed was sown, the plants made such vigorous growth that they were inclined to choke each other. Reaped 7th November; height 4 feet, straw soft and fine, grain fairly good.

Plot 2.—Sown for fodder and grain on the 23rd March; irrigated; previous crop beans; a good dressing of stable manure was applied.

1st cutting 27th May, height 18 inches.
2nd cutting 23rd July, height 18 inches.
3rd cutting 8th November, height 2 feet 6 inches.
Reaped 1st January, 1919, height 3 feet.

Remarks.—Though sown more thinly than No. 1 Plot, it grew so luxuriantly that little difference could be noted. The second cutting was equal to the first; the third cutting was not quite so heavy; when reaped for grain the ears and grain were found equal to No. 1 Plot, and *better than the original seed.*

Plot 2a.—Barley for comparison. Sown on the 23rd March; received exactly the same treatment as Plot 2.

Results :—1st cutting 27th May, height 2 feet.
2nd cutting 23rd July, height 18 inches.
3rd cutting 9th October, height 2 feet.
4th cutting 7th November, failure, not worth reaping.

Remarks.—Second cutting much lighter than the first; third cutting very poor; fourth cutting a failure.

Plot 3.—Sown on the 23rd March; irrigated; previous crop beans; a good dressing of stable manure applied. Cut for green fodder on the 27th May, when 2 feet high. Reaped on the 16th December, height 3 feet.

Remarks.—Straw soft and fine, ears small, grain of good quality, better than original seed.

Plot 4.—Sown on 17th June; irrigated; previous crop, garden crop; light dressing of stable manure given, also a top dressing of the same applied.

1st cutting 9th September, height 18 inches.
2nd cutting 14th October, height 18 inches.
Reaped 18th December, height 3½ feet.

Remarks.—Sown much thinner than the previous plots. Stooled well and made most vigorous growth. Had to be thinned to prevent choking, making good growth between each cutting. Straw fine and soft, ears good, grain good.

Plot 5.—Sown on the 23rd July; irrigated; previous crop, garden crop; received a dressing of stable manure.

1st cutting 7th October, height 18 inches.
Reaped 16th December, height 3½ feet.

Remarks.—Sown very thinly indeed, stooled well, and grew so vigorously as to appear too thick. Straw soft and fine, ear and grain excellent.

Bulawayo Show.

The Twelfth Annual Show of the Bulawayo Agricultural Society will be held on the 26th, 27th and 28th of May next, and the sale of pedigree and well-bred stock on the 29th of May.

The Second Annual Show of Fat Stock, Maize, Produce and Needlework will be held on 2nd September next, and a sale on 3rd September.

The Agricultural Outlook.

Crops.—District reports are generally very favourable. With some local exceptions, rains have been abundant and timely. Although the amount of precipitation has been very heavy, the wet weather has not been so continuous as last season; intervals of bright, warm sunshine have stimulated growth and maintained the health of planted crops, so that arable farmers throughout the country are sanguine respecting the harvest. There is no reason to think that the acreage under cultivation has decreased, and therefore something like record crops may be hoped for in most lines.

Stock.—Some reports from the Midlands refer to a certain amount of mortality among calves from scour, and quarter-evil has been troublesome in parts, but is now kept well in hand by preventive measures. Otherwise, live stock as a whole is in splendid condition, and the prospects of plentiful winter pasturage are exceptionally bright as a result of two consecutive summers with heavy rainfall.

Veterinary Report.

November, 1918.

AFRICAN COAST FEVER.

No cases occurred during the month.

QUARTER-EVIL.

The following mortality was reported:—Umzingwane, 9; Gwanda, 7; Belingwe, 10; Insiza, 11; Plumtree, 33. Several cases of fatal results in cattle from alleged snake-bite were reported. Stock owners

should regard all such cases as suspicious of quarter-evil and forward smears from the affected part for microscopic examination.

CONTAGIOUS ABORTION.

The existence of this disease was detected in one herd of cattle in the Makoni district.

ANTHRAX.

A recrudescence of anthrax infection occurred at Mtoko, and arrangements were made for the vaccination of all cattle in the vicinity.

IMPORTATIONS.

From Union of South Africa:—Bulls, 9; heifers, 6; horses, 14; mules and donkeys, 9; sheep and goats, 2,029.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 682; slaughter cattle *via* Liebig's Drift, 730; donkey, 1; horse, 1; sheep and goats, 198. To Tati Concession:—Sheep, 2,000. To Belgian Congo:—Sheep and goats, 260. To Portuguese East Africa:—Slaughter cattle, 54. To Northern Rhodesia:—Mules, 2; goats, 3.

December, 1918.

AFRICAN COAST FEVER.

No cases during the month.

QUARTER-EVIL.

The following mortality in cattle was reported:—Plumtree, 17; Gwanda, 16; Essexvale, 42; Belingwe, 4; Insiza, 25; Inyati, 36. Several outbreaks occurred in Gwelo district.

ANTHRAX.

The mortality in the Mtoko outbreak referred to in last month's report was 12 head of cattle. All the cattle involved, 1,800 head, have been vaccinated. An outbreak occurred amongst cattle on two farms near Gadzema Station, in the Hartley district. To date 23 head have succumbed. The first cases occurred as far back as August, and were attributed to snake-bite because of the local swellings.

CONTAGIOUS ABORTION.

A fresh centre of infection was discovered in Marandellas district.

IMPORTATIONS.

From the United Kingdom:—Heifer, 1. From the Union of South Africa:—Heifers, 11; bulls, 7; horses, 19; mules, 11; sheep and goats, 2,366.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 784; *via* Liebig's Drift, 64; horse, 1; goats, 21. To Belgian Congo:—Pigs, 85. To Portuguese East Africa:—Slaughter cattle, 82; breeding stock: bulls, 2; heifers, 28. To Northern Rhodesia:—Donkeys, 16.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

February.

BEE-KEEPING.

In some districts a second flow of honey may be looked for from the veld flowers and late growing crops. Honey being secured in either sections or shallow frames should not be permitted to remain too long on the hive at this time of year, as it will become soiled with the bees' feet. Robbers may be anticipated, and this is a sign that the honey flow is nearly over. Where stocks are short of food, feed rapidly inside the hive; excellent feeders can be supplied by appliance dealers. Queenless stocks can now be re-queened, or two stocks can readily be united by previously dusting each lot with household flour. Grade and dispose of honey. It may be advantageous to reserve the choicest specimens for exhibition and competition at our forthcoming agricultural shows.

CITRUS FRUITS.

The notes on planting still apply, if trees are still planted this month, an operation which, however, it is not desirable to leave so late. Trees planted after about the end of January may only get established when it is too late that season for them to commence growth, the consequence being that what growth there is is still sappy at the approach of the cold weather and so stands a chance of being nipped. In such case the tree would have been better left in the nursery row to be lifted and transplanted into the orchard the following spring.

By the end of February or early March the cover crop should be ready to plough into the orchard, with the possibility of sufficient rains after it is done to assist in rotting the plants in the soil. A continuous watch should be kept for insect pests, and fumigation or spraying undertaken immediately any pest is observed. If no cover crop has been sown, the orchard should be kept in a good state of cultivation, and not allowed to be overrun with grass and weeds. Destroy all fruit infested with Natal codling moth by burning or burying deeply. Some success has been obtained by smearing the first oranges that begin to turn colour with tanglefoot, as these are the first fruits to be attacked by the pest. Do not allow the fruit to fall to the ground before destroying it, but pick all affected fruit as soon as it is observed.

CROPS.

During this month the farmer's energies will be concentrated on keeping the lands thoroughly clean, and if this is done effectively now, no further serious damage from weeds need be feared. Most summer crops will be in the ground. Maize for ensilage may still be sown, also catch crops of buckwheat and teff for hay and seed. The main maize crop should be cleared of suckers, which can be fed to stock. The most vigorous plants should be marked for seed selection by cutting the stalk above the cob, and the date of tasselling should be noted both in the main crop and the ensilage crop. In case of excessive moisture, the use of the wing shovel plough is strongly recommended. Monkey nuts should not be cultivated after the period of flowering, which is usually early in February. Hay-making should start in February if weather conditions allow. The sooner the veld is cut for hay the better the product obtained. Land for winter crops of oats and wheat should now be got ready as weather conditions permit. Napier's fodder

slips planted early in the season can now be divided. Potatoes are sometimes planted this month in order to obtain seed for the early plantings the following season.

DECIDUOUS FRUITS.

This is the time to carry out summer pruning, after harvesting the crop, and when the flow of sap begins to become sluggish.

ENTOMOLOGICAL.

Maize.—The first brood of the stalk borer matures this month, and the young of the second brood may be found amongst the younger leaves. Weeds should be kept down (see March). Certain caterpillars are sometimes troublesome. See "Some Insect Pests of Maize," *Agricultural Journal*, June, 1912, and "Some Injurious Caterpillars," *Agricultural Journal*, February, 1915.

Tobacco.—Stem borer, leaf miner and budworms are the chief pests likely to be troublesome. See "Handbook of Tobacco Culture," published by the Department of Agriculture, pp. 71-99.

Potato.—Ladybirds and tuber moth may call for attention; the latter, when very bad, sometimes causes considerable wilting of the crop besides attacking the tubers. See *Agricultural Journal*, October, 1913, and February, 1910.

Cabbage Family.—All members of the family are liable to the attack of sawfly and webworm during February. See *Agricultural Journal*, February, 1914; April, 1910; and April, 1911.

Beans and Cowpeas.—These suffer chiefly from stem maggot and blister beetles, which destroy the blossoms. The latter must be collected by hand. The former is dealt with in the number of this *Journal* for April, 1913.

Melon Family.—The most important pest is the melon fly, which "stings" the fruit of all species of gourds. At present no remedy is known except collecting and destroying the infested fruit early in the season. Aphis on the leaves and shoots may be destroyed by careful spraying with tobacco and soap wash or paraffin emulsion.

Mangolds and Beets.—These are frequently defoliated by caterpillars. Spray with an arsenical wash.

Citrus Trees.—The chief pest requiring attention during February is citrus codling. The infested fruit should be gathered and destroyed regularly. The fruit is also apt to be attacked by large fruit-piercing moths, for which unfortunately no remedy is known.

Deciduous Trees.—Apple, pear and late peaches suffer chiefly from fruit moths which puncture the fruit. No remedy is known except netting the trees.

Fig.—The fruit is liable to the attack of fig weevil. Infested fruit and all wild figs near the trees should be collected and destroyed. The borer in the stem may be killed by inserting a little carbon disulphide into the burrow and sealing it up.

Castor Oil.—Two-year-old plants which contain borer should be cut down and burnt. See *Agricultural Journal*, October, 1912.

FLOWER GARDEN.

During this month the flower garden is gradually approaching perfection, and nearly all plants are in bloom. If these are constantly plucked the yield will be increased, and except where required for seed, all flowers should be removed as they fade, for seeding shortens the life of many plants. All runners and creepers should have constant attention, and be tied up and trained. Dahlias in more exposed positions should be carefully tied to their stakes, as they now become top heavy with the weight of their blooms. Palms in the house and conservatory will benefit much if occasionally put out in the rain.

FORESTRY.

Complete planting out of ever-greens. Sow in nursery seeds of slow growing species such as cypress, pines, etc. All planting should be completed this month, in the early part if possible.

GENERAL.

This is a busy time for the farmer. Weeds will be very much in evidence and difficulty will be experienced in keeping them under. Stock will have fully recovered their condition, but ticks will be troublesome. The dipping tanks must be fully utilised now.

POULTRY.

The breeding season is approaching. Hatching should commence in April and run on to the end of August for heavy breeds; to the end of September, if necessary, for the light breeds. During February watch your birds and choose for mating in March. Of the old birds, those that have come quickly through the moult, that are laying well, shew strength and activity; of the young pullets, those that shew best growth and condition, that are laying well; of the cockerels pick out the strongest, most vigorous and healthy. Keep insects in check by spraying and dipping. Do not allow droppings to accumulate in the house during the damp weather especially, as these are a source of ill health and disease, and such neglect lessens the output of eggs. All the surplus cockerels and old hens should by this time have been killed or sold for killing. Every bird kept over and above what is needed means so much more food and attention. Birds running free require little or no food, as there is sufficient natural food for them at this time, but if their crops are not quite full at roosting time, give a few crushed mealies, but no food at all should be given during the day. Throw the crushed mealies when given into some dry grass or litter, never on to the bare ground.

STOCK.

Cattle.—Grass will now be at its best, and no anxiety need be felt about feed. In the case of milking cows which have been fed during the earlier rainy months, a little crushed and soaked mealies, or something similar, may still be given at milking, if only to bring the cows quietly to their places. The importance of a clean, light, airy and well-drained shelter for calves cannot be over-estimated. Calves up to three or four months old do not require a great deal of exercise, and on wet days are better left in a dry shed with a little sweet hay. A few hours' exercise on bright days in short grass is all they need. Vigilance in keeping down ticks must not be relaxed. These remarks apply specially to milking herds and to cattle that are kraaled. Cattle running at large need little attention beyond dipping, and if the calves are not desired from November to March, the bulls must now be taken out of the herd.

Sheep.—Vleis and low-lying ground must be avoided. Sheds should be airy, dry and clean. If grass seeds are troublesome to woolled sheep, an area should be mown for them, or when rain begins to slacken, they may be shorn. If wire worm is troublesome, dose and move to fresh grazing and kraals.

TOBACCO.

The early tobacco should now be ready for curing. Care should be taken to select only thoroughly ripe leaf for filling the barns, so that the cured product will be uniform. Topping and suckering should be given attention. Selected seed plants should be given careful attention. New land intended for tobacco next year should be ploughed this month, so that all organic matter turned under may be converted into humus before planting time next season.

VEGETABLE GARDEN.

Potatoes should receive attention and be carefully ridged up, and care taken that the stalks are not buried. Seeds for winter crops should be sown, such as beet, Brussels sprouts, cabbage, carrots, beans, peas, onions, turnips, tomatoes, etc. Vegetables planted out during this month might be placed a little closer together than usual, as watering may have to be resorted to before they mature.

VETERINARY.

This is a bad month for horsesickness. Redwater and gallsickness in cattle occur all the year round, but the summer months, when ticks are active, is the worst time. Three-day sickness in cattle may now be looked for. Trypanosomiasis is a summer disease. Blue tongue is somewhat similar to horsesickness, and February is a bad month. The disease has so far only been found in imported merinos, but it spreads from these to indigenous sheep. After twelve months in the Territory, sheep do not contract the disease. The first symptom is laminitis, the second a protruding blue tongue. White scour may be prevalent now, but dipping is eradicating the disease.

WEATHER.

This is generally the wettest month of the year, with marked differences of from 10 inches to 15 inches on the eastern mountain ranges, 7½ inches over Mashonaland, 4 inches to 6 inches in Matabeleland, and least, but still some, rains in the Limpopo Valley. The rains may be expected to decrease in intensity after the middle of the month if the season is normal.

March.

BEE-KEEPING.

Be on the look-out for damage to stocks by the wax moth; strong stocks generally tend to obviate this pest. Where the heavy rains have penetrated the weak hive roofs and caused dampness among the quilts, these should be taken off and thoroughly dried in the sun, then replace. Contract the entrances of hives to prevent robbing. Unsold honey should be stored in a warm dry cupboard. Keep apiary clear of weeds.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring.

CROPS.

For general cultural treatment, see February notes. Rape and kale for autumn feeding may be sown during the latter half of this month. Haymaking can continue. Land for winter crops of oats and wheat should now be ready. The division of Napier's fodder slips can be continued up to the

end of this month. Buckwheat, linseed, teff grass and manna will be ready for reaping this month. The silo pit should now be got ready. Maize will be ready for ensilage in four to five weeks after the period of tasselling.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood will be found freely in the stalks, but nothing can be done at this stage. Caterpillars may attack the crop during this month, usually *as a sequence to cultivation after the weeds have been allowed to get too far ahead.* The caterpillars attack the crops on account of their food being suddenly destroyed. See "Some Insect Pests of Maize," *Agricultural Journal,* June, 1912; and "Some Injurious Caterpillars," *Agricultural Journal,* February, 1915.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but any plants still infested with stem borer should be removed and burned. Leaf miner will still be in evidence, and budworms may put in an appearance. See "Handbook of Tobacco Culture," published by the Agricultural Department, pp. 71-90.

Potato.—Ladybirds may still be injurious. See *Agricultural Journal,* October, 1913. Careful hilling should be attended to on account of the tuber moth. See *Agricultural Journal,* February, 1910.

Cabbage Family.—Sawfly. See *Agricultural Journal,* April, 1910; and April, 1911. The fly will probably be less injurious by this time. Cabbage louse may be on the increase. Very thorough spraying with tobacco wash and soap is of value when the plants are young.

Beans and Cowpeas.—The most obvious enemies are the blister beetles, which destroy the blossoms. These can only be destroyed by hand. Stem maggot continues injurious, causing dropping of leaves on the larger plants, but little can be done at this stage.

Melon Family.—Plants of this family are subject to the attack of melon fly and aphis. Careful spraying with tobacco wash or paraffin emulsion is of value against the latter.

Sweet Potato.—Hawk moth caterpillars occasionally appear in countless thousands and defoliate the crop. Immediate spraying with an arsenical wash is called for when the insects first appear. See *Agricultural Journal,* June, 1912.

Citrus Trees.—Attention should constantly be given to the systematic collection and destruction of infested fruit to keep down the citrus codling. Large fruit-piercing moths may attack the fruit during the month (see under February).

Deciduous Trees.—But little damage from insects is likely to occur to these fruits during March.

Fig.—Fig weevil still calls for attention in collecting and destroying the infested fruit.

Castor Oil.—See under February.

FLOWER GARDEN.

During this month the garden should be seen at its perfection, and, owing to our rains, requires a great deal of attention in order to keep the soil free from weeds and caking. Drainage should also be looked to, in order to avoid plants being swamped or washed away. Dahlias and carnations should now be in their heaviest bloom, and will require tying up, and the dying blooms should be removed, in order to prolong their flowering period. Plants for winter flowering should now be coming on and planted out. Cuttings of carnations may now be made, and should be picked from the choicest plants, and taken from stems which have borne the finest blooms. The cuttings should be placed in boxes containing sand, and kept in a moist condition in a warm position sheltered from the winds. These should be ready for planting out in about two months, and bloom in three.

Carnations, verbena, antirrhinum, penstemon, pansy, dianthus, phlox, calliopsis and escholtzia may be sown for early blooming next spring.

FORESTRY.

If necessary, cultivate between the rows of trees planted out in the previous months. Plough any fire lines that are necessary and break up any new ground that will be required for next season's planting. Remember that the roots of trees penetrate deeply into the ground, and therefore plough as deeply as possible. Where black wattle thrives, sow seed this month, after well soaking.

GENERAL.

At this time the condition of stock on the veld is good—perhaps at their best. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

(See February notes.)

STOCK.

Cattle.—The precautions recommended for February apply equally to March. Weather permitting, no opportunity should be lost of getting in good, sweet hay before grass is too old. Arrangements should be completed for storing as much silage as it is proposed to make, so that the crops reserved for this purpose may be harvested immediately they are ready.

Sheep.—The same precautions as for February should be taken, but as less rain may be expected, conditions will probably be more favourable. If late winter lambs are not desired, the rams should be removed from the flock.

TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed.

VEGETABLE GARDEN.

Tomatoes, peas and beans should be in full bearing, and should be staked and tied. Weeding and cultivation should be extensively carried out. Seeds for late winter crops—beans, cabbage, cauliflower, peas, radish, turnips, spinach and beet—should be sown.

VETERINARY.

Horsesickness is now prevalent. Redwater and gallsickness occur in cattle all the year round, but the worst time is the summer, when ticks are numerous. Trypanosomiasis is a summer disease. Blue tongue may now be expected.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1918	November	9·56	0·44	0·11	0·32
1918	December	8·66	0·43	0·14	0·28

TEMPERATURES.

Station	November		December	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	86·7	50·4	84·0	49·4
Hartley—				
Franceys Farm	88·3	63·3	84·5	57·9
Gatooma	90·2	63·7	85·8	63·3
Hartley Gaol	—	—	—	—
Lomagundi—				
Eldorado Mine	—	—	—	—
Sinoia	90·2	66·7	86·3	67·0
Sipolilo	88·1	49·0	83·7	42·5
Mazoe—				
Mazoe Dam	84·8	49·7	83·7	48·9
Shamva Mine	85·3	61·8	77·4	60·0
Melsetter—				
Melsetter	77·0	56·8	77·2	56·8
Mount Selinda	76·0	60·7	80·7	61·3
Vermont	77·8	59·7	78·7	61·4
Salisbury—				
Botanical Experiment Station...	—	—	80·0	56·6
Chishawasha	84 2	59·3	81·2	59·8
Salisbury Gaol	86·1	58·0	82·8	57·3
Umtali—				
Public School	—	—	—	—
Victoria—				
Eythorne	76·3	51·0	86·2	55·5
Morgenster	—	—	—	—
Victoria	82·4	60·6	81·8	62·0

TEMPERATURES—*(Continued).*

Station	November		December	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	86·3	61·8	83·4	63·4
Garth	90·0	64·1	90·2	64·9
Plumtree School	87·7	61·8	—	—
Riverbank	90·8	62·4	89·4	62·2
Retreat	95·8	64·0	92·9	65·2
Bulawayo—				
Observatory	84·4	58·2	—	—
Gwanda—				
Antelope Mine	90·2	69·4	87·9	69·7
Mazunga	96·9	64·4	94·6	66·2
Tuli	96·9	—	100·0	—
Gwelo—				
Gwelo Gaol	85·1	55·8	83·3	56·5
Matobo—				
Holly's Hope	91·1	63·1	89·4	64·3
Rhodes Matopo Park ...	89·8	61·6	86·7	61·2
Umzingwane—				
Essexvale	87·2	62·4	85·8	63·9
Hope Fountain	84·4	59·3	83·2	59·6
Wankie—				
Guyo	92·1	69·7	87·6	66·4
Victoria Falls	—	—	—	—
Wankie Hospital	97·3	68·9	—	—

RAINFALL.

Station	November	December
MASHONALAND—		
Charter—		
Buhera	3·68	4·77
Bushy Park	2·66	4·90
Enkeldoorn Gaol	2·28	6·77
Marshbrook	7·23	3·02
Range	4·11	5·45
Riversdale	3·70	10·48
Umniati	1·00	5·65
Vrede	0·70	4·67
Wylde Grove	3·07	4·87
Chibi—		
Chibi	2·75	2·10
Lundy River	2·90	—
M'Rumi	1·98	—
Nuanetsi Ranche	1·65	2·17
Chilimanzi—		
Central Estates	3·53	6·91
Chilimanzi	3·08	2·81

RAINFALL—*(Continued).*

Station	November	December
Mashonaland—(Continued)		
Chilimanzi—continued		
Driefontein	4·59	3·56
Induna Farm	3·83	3·89
Orton's Drift	5·79	5·21
Umvuma (Railway)	2·69	7·20
Darwin—		
Mount Darwin	4·11	5·64
Gutu—		
Chingombe	3·61	7·31
Eagle's Nest Ranche	4·59	4·94
Gokomere	2·50	6·01
Gutu	3·43	6·12
Hartley—		
Ardgowan	3·33	5·36
Battlefields (Railway)	3·20	5·53
Beatrice (B.S.A.P.)	—	6·80
Carnock Farm	6·02	—
Cringleford	7·53	8·85
Elvington	4·27	5·88
Franceys Farm	9·50	4·01
Gadzema (Railway)	6·86	8·89
Gatooma	3·46	8·08
Gatooma (Railway)	4·73	6·64
Gowerlands	3·54	5·12
Hallingbury	5·82	7·56
Hartley Gaol	4·67	—
Hartley (Railway)	7·39	7·55
Jenkinstown	—	—
Makwiro (Railway)	8·45	10·68
Ranwick	5·87	8·53
Shagari (Chevy Chase)	3·91	5·32
Spitzkop	—	—
Inyanga—		
Inyanga	9·74	—
Inyanga Settlement	9·13	—
Rhodes Estate	5·44	4·23
St. Trias' Hill	9·03	6·79
Lomagundi—		
Argyle	9·65	4·02
Banket Junction (Railway)	6·54	5·31
Darwendale	6·67	3·62
Duxbury Farm	6·24	1·14
Eldorado Mine	—	—
Eldorado (Railway)	6·36	4·86
Gambusi (Mukore)	8·72	3·66
Lone Cow Estate	5·19	—
Longmead	6·73	1·64
Maningwa	6·41	5·96
Mukwe River Ranche...	6·60	3·82
Palm Tree Farm	4·86	1·07
Sinoia	6·87	3·49
Sinoia (Railway)	6·02	3·04
Sipolilo	3·18	6·02
Umvukwe Ranche	5·96	—

RAINFALL—(*Continued*).

Station	November	December
MASHONALAND—(Continued)		
Makoni—		
Carlow Farm	5·79	3·55
Chimbi Source	7·85	6·09
Craigendoran	7·91	9·55
Delta	6·73	4·00
Eagle's Nest	6·35	6·40
Forest Hill	—	6·57
Gorubi Springs	8·45	6·61
Headlands (Railway)	6·21	3·31
Mona	5·36	6·53
Monte Cassino Mission	5·71	5·45
Odzi (Railway)	9·08	8·69
Rusape	7·21	3·34
Rusape (Railway)	8·01	3·40
Springs	7·54	4·94
York Farm	8·35	6·04
Marandellas—		
Bonongwe...	4·43	5·81
Huish Estate	4·96	5·17
Land Settlement Farm	4·68	7·26
Macheke (Railway)	5·64	5·74
Marandellas	10·95	7·07
Marandellas (Railway)	10·45	6·86
Nelson	4·97	4·79
Selous Nek	3·96	8·41
Theydon	—	—
Tweedjan	4·45	3·15
Verdoy	—	—
Mazoe—		
Avonduur	4·00	9·13
Bindura	6·65	8·02
Bindura (Railway)	7·41	7·60
Ceres	—	7·28
Chipoli	5·48	9·76
Citrus Estate	4·82	7·48
Concession (Railway)	8·10	5·37
Craigengower	6·10	6·57
Dunmaglas	3·50	—
Glendale (Railway)	2·95	8·21
Kilmer	4·46	7·52
Kingston	5·57	7·66
Laguaha	5·24	5·59
Lowdale	5·89	7·18
Mazoe	4·24	—
Mazoe Dam	5·94	8·48
Mguta Valley	6·35	—
Omeath	3·44	5·17
Ruia	7·01	6·16
Ruoko Ranche	4·21	9·16
Shamva	6·77	10·47
,, Mine	6·69	7·21
Stanley Kop	5·18	4·60
Sunnyside	6·65	5·56
Teign	8·99	7·95
Virginia	4·16	7·00
Volynia Ranche	5·03	9·95

RAINFALL (*Continued*).

Station	November	December
MASHONALAND—(Continued)		
Melsetter—		
Brackenburg	6·15	7·84
Chikore	6·60	4·87
Chipinga	8·38	4·71
Helvetia	9·69	10·87
Melsetter	5·93	5·00
Mount Selinda	9·51	5·42
Mutambara Mission	5·27	—
Pasture	4·50	9·39
Tom's Hope	8·34	7·25
Vermont	10·48	6·08
Mrewa—		
Glen Somerset	5·61	3·16
Mrewa	3·19	—
Mtoko—		
Makaha	5·47	5·15
Mtoko	6·70	4·66
Ndanga—		
Bikita	8·94	4·41
Chiredzi Ranche	3·25	3·93
Marah Ranche	3·88	5·31
Ndanga	4·44	5·30
Salisbury—		
Ardbennie	5·66	7·10
Avondale	4·47	9·45
Borrowdale (Hatcliffe)	4·26	4·60
Botanical Experiment Station	—	7·19
Bromley	4·16	7·88
Brookmead	5·88	10·71
Chishawasha	4·19	9·29
Cleveland Reservoir	5·57	—
Ewanrigg	6·34	8·38
Forest Nursery	4·03	5·98
Glenara	6·85	6·93
Goromonzi	10·18	7·63
Gwebi	6·34	7·02
Hillside	3·83	6·29
Lilfordia	5·34	—
Meadows (The)	8·88	8·81
Salisbury (Gaol)	5·59	6·35
,, (Railway)	5·98	5·43
Sebastopol	6·72	6·77
Selby	7·00	—
Stapleford	7·47	13·13
Sunnyside	3·91	8·67
Vainona	5·19	7·19
Westridge	4·48	9·42
Umtali—		
Chiconga	6·56	7·38
Hoboken	8·52	6·59
Odzani	7·66	4·70
Penhalonga	5·78	9·09
Premier Estate	4·30	7·70
Public School	—	—

RAINFALL *(Continued)*.

Station	November	December
MASHONALAND—(Continued)		
Umtali—continued		
Sarum	5·17	8·15
Stapleford	11 41	9·86
St. Augustine's Mission	6·01	—
Stralsrund	5·66	2·57
Umtali (Railway)	5·31	4·72
Utopia	4·94	6·50
Victoria—		
Brucehame	3·44	5·40
Clipsham	3·59	7·11
Empress Mine	1·90	—
Eythorne	4·23	5·27
Fort Victoria (Railway)	2·90	3·11
Jichidza Mission	6·65	8·54
Makorsi River Ranche	2·70	6·80
Morgenster Mission	—	—
Mtumoi Ranche	5 42	4·61
Noeldale	5·13	3·49
Silver Oaks	3·17	3·12
Summerton	3·26	—
Victoria	3·09	2·80
MATABELELAND :		
Belingwe—		
Bickwell	1·38	4·54
Tamba	1·98	2·93
Wedza	1·03	3·72
Bubi—		
Bembesi (Railway)	2·96	3·04
Imbesu Kraal	2·66	3·31
Inyati	1·96	5·77
Maxim Hill	2·88	—
Shangani Estates	2·24	3·77
Bulalima-Mangwe—		
Empandeni	2·12	5·51
Figtree	1·87	4·65
Garth	1·86	2·73
Holdstock	1 95	4·59
Maholi	1·90	—
Plumtree Public School	2·84	—
Retreat	1·06	5·02
Riverbank Farm	1·35	3·85
Solusi Mission	2·51	5·05
Tjompanie	1·05	7·06
Tjankwa	2·81	5·69
Bulawayo—		
Keendale	1·61	3·13
Khami	2·66	5·42
Lower Rangemore	1·52	5·72
Observatory	—	—
Raylton (Railway)	3·07	4·18
Saw Mills (Railway)	3·41	2·99
Umgusa	—	—

RAINFALL (*Continued*)

Station	November	December
MATABELELAND—(Continued)		
Gwanda—		
Antelope Mine	1·84	6·11
Gwanda (Gaol)	0·81	5·00
Gwanda (Railway)	0·80	4·74
Lamulas	2·02	1·90
Langalanga	0·62	5·10
Mahalali	Nil	2·58
Manantji	1·21	1·66
Mazunga	1·26	4·51
Mapande	0·49	2·75
Mrandas	1·44	1·74
Mtshabezi Mission	1·32	3·13
Mwanezi	1·17	1·85
Sovelele	2·29	3·17
Tuli	1·26	3·66
West Nicholson (Railway)	2·34	7·86
Gwelo—		
Daisyfield	1·72	3·82
Dawn	4·99	4·45
Globe and Phœnix Mine	1·47	5·40
Globe and Phœnix (Railway)	1·43	5·05
Gwelo (Gaol)	4·91	6·34
Gwelo (Railway)	4·75	5·48
Hunter's Road	4·25	2·91
Lalapanzi (Railway)	—	—
Lovers' Walk	—	5·09
Lower Gwelo	3·35	2·36
Oaklands	3·16	3·03
Rhodesdale Ranche	2·94	4·84
Rio	1·93	2·60
Riverdale	—	2·68
Sikombela Farm	1·46	—
Woodendhove	—	—
Insiza—		
Albany	4·15	4·22
Filabusi	1·23	4·05
Fort Rixon	2·88	4·07
Infiningwe	2·41	2·96
Insiza (Railway)	1·89	5·04
Inyezi Farm	1·39	2·54
Orangedale	3·98	4·27
Roodeheuvel	2·08	5·32
Shangani (Railway)	3·79	4·69
Thornville	2·78	5·97
Matobo—		
Holly's Hope	1·16	6·03
Matopo Mission	1·97	4·91
Rhodes Matopo Park	2·39	6·87
Edwalemi	1·99	4·03
Impondemi	2·97	2·53
Nyamandhlovu—		
Melinakanda Junction	2·54	—
Naseby Farm	1·93	4·44
Nyamandhlovu (Railway)	2·72	2·34

RAINFALL (*Continued*).

Station	November	December
MATABELELAND—(Continued)		
Sebungwe—		
Gokwe	4·06	4·04
Inyoka	3·57	4·04
Selukwe—		
Hillingdon	2·90	4·78
Selukwe (Railway)	4·64	6·90
Umzingwane—		
Balla Balla (Railway)	1·17	4·21
Crombie's Hotel	2·86	3·59
Essexvale	2·37	3·18
Heany Junction (Railway)	—	3·71
Hope Fountain	3·31	—
Ntabenende	4·73	3·45
Springs Farm	2·55	4·92
Wankie—		
Dett (Railway)	3·37	2·01
Guyo	—	—
Lynwood Estate	4·89	6·09
Matetsi (Railway)	2·41	4·02
Ngamo (Railway)	2·27	2·84
Victoria Falls	2·51	4·49
Victoria Falls (Railway)	3 76	4·12
Wankie Hospital	2·52	—
Wankie (Railway)	—	2·86

— No return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1919 February	March	April
Beatrice Road	Various farmhouses	A. V. Johnson	..	..	..
Bembesi	Queen's Mine Hotel	V. C. Andrews	7	7	4
Bindura	Bindura	C. J. Glen	8	8	12
Bromley	Bromley	C. J. Shirley	6	6	3
Charter—Mgezi	Beatrice Mine	W. Krienke	26	26	30
Central	Umvuma	W. A. James	22	29	26
Eastern Border (South Melsetter) ..	Helvetia	——	14	14	11
Enterprise	Arcturus Hotel	R. Philip	5	5	2
Felixburg—Gutu	Felixburg	R. H. Brown	..	8	..
Figtree Branch, R.L. and F.A. ..	Figtree Hotel	W. H. Robertson	1	..	5
Gatooma	Gatooma	T. J. Golding	15	15	19
Gazaland	Chipinga	J. Myers	22	29	26
Greystone	Various farm houses, Shangani ..	M. Kerr	8	8	12
Hartley	Hartley	W. M. Leggate	Sat. b'f're full	moon unles	s f.m. on Fri.
Headlands	Headlands	J. Grewar	22	..	26
Hunter's Road Farmers and Stockowners	Hunter's Road Siding ..	R. H. Twilley	8	8	12
Insiza—Shangani	Shangani	M. E. Weale	..	1	..
Inyanga	Farm Cheshire	F. W. Thiel	22	29	26
Inyazura	Inyazura	A. C. Curling	19	19	16
Iron Mine Hill	Iron Mine Hill	T. Irving	8	8	12
Lalapansi	Lalapansi	T. Wotherspoon	15	15	19
Lomagundi	Sinoia	A. H. Layard	Saturday	nearest full	moon
Macheke	Macheke	J. Cheyne	No	fixed dates	
Makwiro	Makwiro	D. M. Syme	21	21	18
Marandellas, Northern	Marandellas Farmers' Hall ..	A. Nicholson	1	1	5
Marandellas, Southern	Inoro	G. Seagar	5	5	2
Makoni	Makoni	J. G. Monckton	22	29	26
Mashonalan	Commercial Hotel, Salisbury ..	J. Reid Rowland	5	5	2
Mashonaland, Northern Section ..	Various	T. H. Newmarch	No	fixed dates	
Mashonaland, Western Section ..	Various	J. W. Dunlop	No	fixed dates	
Matopo Branch, R.L. and F.A. ..	Sibali	——	..	12	..
Mazoe	Glendale Siding	A. G. McCall	12	12	9
Melsetter (North)	Various farms	N. N. Rutherfurd	..	1	..
Midlands Farmers and Stockowners ..	Gwelo	Cyril Allen	14	14	11
Northern Umtali	Farm Summerfield	R. O. H. Blurton	..	1	..
Norton and District	Norton Store	C. P. Watermeyer	1	1	5
Que Que	Que Que	E. J. Ross	15	15	19
Rhodesian Landowners and Farmers ..	Library Buildings, Bulawayo ..	H. S. Hopkins	28	28	25
Rusape	Rusape	C. Tapson	8	8	12
Shamva	Shamva	R. C. Frith	..	19	..
Selukwe	Selukwe	F. S. Clark	No	fixed dates	
Somabul and hangani Flats ..	Weltevrede School	G. B. Botha	..	8	..
Umvukw	Various ranches	M. Mitton	15	8	12
Umtali	Christmas Pass Hotel	J. S. Holland	1	1	5
Victoria	Victoria	——	7	7	4
Victoria Midlands	——	E. F. Robertson	..	..	..
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	8	8	12

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Forest Nursery—Sale of Trees

The undermentioned varieties of trees are now available, price, f.o.r. Salisbury, 1d. each, 8s. 4d. per 100. The following reductions are made on large orders:—£3 per 1,000, £2 10s. per 1,000 for orders of over 5,000. Average height of trees, 3 to 9 inches; average number in tin, 25; average weight of tin, 25 lbs. If tins are not returned within a month, they will be charged for at the rate of 6d. each.

Callitris calcarata—Cypress pine.
Casuarina leptoclado—Beefwood.
Cedrela toona.
Cupressus arizonica.
,, torulosa—Himalayan cypress.
Eucalyptus amygdalina—Peppermint gum.
,, botryoides.
,, citriodora—Lemon-scented gum.
,, crebra—Ironbark.
,, melliodora—Grey box gum.
,, paniculata—Ironbark.
,, robusta—Swamp mahogany.
,, rostrata—Red gum.
,, saligna.
,, maculata—Spotted gum.
Jacaranda.
Loquat.
Thuya orientalis—Arbor vitæ.
Croton sylvaticus.

Hedge Plants (plant 12 to 18 inches apart).

Callistemon—Bottle brush.
Dodonaea viscosa.
Tecoma Smithii.

Larger sized trees at 3d. each, 4 in tin, weighing 25 lbs. :—

Callitris calcarata—Cypress pine.
,, Whytei—Blantyre cedar.
Casuarina leptoclado—Beefwood.
Cupressus arizonica.
,, torulosa—Himalayan cypress.
Eucalyptus botryoides.
,, rostrata.
,, saligna.
Jacaranda.
Loquat.
Tristania conferta.
Thuya orientalis.
Cedrela toona.

Shrubs

Price, f.o.r. Salisbury, 6d. each. Some of these are planted 4 in tin, but there is usually a fair stock in single tins.

Red.	Approx. height of growth.
Habrothamnos	5 ft.
Callistemon—Bottle brush	10 ft.
Hibiscus, single	8 ft.
,, double	6 ft.
Holmskioldia	8 ft.
Iochroma	8 ft.
Poinsettia	8 ft.
Russellia	3 ft.
Tecoma capensis—Kaffir honeysuckle	6 ft.
Pomegranate	8 ft.
Pink.	
Lagerstrœmia flos-regina—Indian crepe	10 ft.
Sensitive plant	1 ft.
Mauve—Magenta.	
Bauhinia	20 ft.
Bougainvillea	10 ft.
Iochroma	10 ft.
Salvia	3 ft.

	Approx. height of growth.
Blue.	
Buddleia	6 ft.
Duranta	10 ft.
Iochroma	8 ft.
Plumbago	3 ft.
White.	
Althea	5 ft.
Bauhinia	20 ft.
Deutzia—Bridal wreath	5 ft.
Gardenia	4 ft.
Hawthorn—Evergreen	15 ft.
Lantana bush	8 ft.
Lemon-scented verbena	5 ft.
Spirea—Cape may	4 ft.
Yellow.	
Abutilon—Chinese lantern	8 ft.
,, Variegated leaf	8 ft.
Acacia cultriformis—Wattle	12 ft.
Alamanda nerifolia	4 ft.
Broom	8 ft.
Buddleia	10 ft.
Cape jasmine	10 ft.
Cassia—Cape laburnum	8 ft.
,, corymbosa	
,, canariensis	
,, didymobotrya	
,, eromophylla	
,, glauca	
,, occidentalis	
Cestrum aurantiacum	5 ft.
Holmskioldia	8 ft.
Hypericum—St. John's wurt	4 ft.
Streptosolon Jamesonii	3 ft.
Tecoma Smithii	10 ft.
Thevetia nerifolia	6 ft.

Climbers.

Bougainvillea—Magenta.
Clitoria ternata—Mussel shell creeper—Blue.
Cereus grandiflora (queen of the night)—Yellow.
Dutchman's pipe (Aristolochia sypho).
Golden shower (Bignonia venusta).
Granadilla.
Honeysuckle—White.
Ivy.

Jasmine—White.
,, sambac—White.
,, Yellow.
Mandevillea—White.
Potato creeper (Solanum Wenlandii)—Blue.
Zimbabwe creeper (Podranea)—Pink.

Shrubs for Hedges

Price 3d. each; planted 16 in tin, weighing 25 lbs.

Duranta—Blue.
Holmskioldia—Red.
Lantana bush—White.
Macartney rose.
Tecoma capensis—Red.

No orders can be supplied until paid for. Full particulars regarding forwarding should be addressed to the Government Agriculturist and Botanist, Department of Agriculture, Salisbury. If tins are not returned within a month they will be charged for at the rate of 6d. each.

The following trees, plants and shrubs may be obtained from the Rhodes Matopo Park, Matopos:—

In single tins, size of plants 3 to 9 inches; price per plant, 3d.:—

Jacaranda.
Casuarina quadrivalvis.
,, tenuissima.
Cupressus arizonica.
,, elegans.

20 in tin, at 1d. each:—

Eucalyptus resinifera.
,, polyanthema.

Shrubs, 3 to 9 inches high, in single tins, 6d. each:—

Duranta Plumieri.
Callistemon salignus (Bottle brush).
Poinsettia.
Podranea (Zimbabwe creeper).
Aberia caffra (Kei apple).

Napier fodder can be supplied in bags containing approximately 200 roots at 5s. per bag.

Applications for trees or plants from the Matopo Park nursery should be made to W. E. Dowsett, Rhodes Matopo Park, Matopos, and the prices quoted above are f.o.r. Matopos.

List of Plants for Sale at Matopo Estate

Trees.

Acacia baileyana.
,, longifolia.
Casuarina tenuissima.
Cedrela toona.
Cupressus sempervirens.
Dalbergia sisso.
Eucalyptus hemiphloia.
,, gunni rubra.
,, longifolia.
,, melliodora.
,, poulifolia.
,, redunca.
,, resinifera.
,, sieberiana.
,, leucoxylon.
Grevillea robusta.
Jacaranda.
Morus nigra.
Pinus longifolia.
,, halepensis.
,, pinaster.
,, pinaster hamiltonii.
,, canariensis.
,, muricata.
Thuya occidentalis.
Schinus molle.

Hedge Plants.

Aberia caffra (Kei apple).
Lycium horridum.
Tecoma stans.
Thuya occidentalis.
Duranta plumieri.
Plumbago capensis.

Shrubs.

Abelia florabunda.
Acacia cultriformis.
Callistemon.
Duranta.
Datura (Moonflower).
Hibiscus moscata.
Iochroma.
Jasmine.
Pomegranate.
Parkinsonia.
Podranea.
Poinsettia.
Plumbago.
Tecoma stans.
Thevetia nerrifolia.
Sutherlandia.
Yucca augustifolia.
Lavender.
Napier fodder.

The Dairy Industry

The services of a dairy expert, Mr. J. B. Fisher, N.D.D., are now available to the public for consultation, advice and instruction. Enquiries should be addressed to him direct at the Department of Agriculture, Salisbury. Addresses and demonstrations may be arranged, and as a guide to farmers' associations or other bodies desiring lectures, the following subjects are mentioned as being suitable for this purpose, although any cognate subject specially desired can be dealt with :—

1. The care of milk from the cow to the dairy.
2. Cream separators and their use.
3. Butter-making on the farm.
4. Milk and cream testing.
5. Hard cheese-making : cheddar, etc.

6. Sweet milk cheese-making: Gouda, etc.
7. Soft cheese-making: cream, cottage, Gervais, etc.
8. Preparation of cream for sale to butter factories.
9. Curing of bacon and ham on the farm.
10. The milk record of a herd.

The Poultry Industry

A poultry instructor, Mr. A. Little, having now been added to the staff of the Department of Agriculture, farmers' associations, individual farmers and poultry keepers are invited to communicate with him direct on all matters relating to the subject. Personal visits where desired will be arranged, and lectures can be delivered on various aspects of the subject. For the guidance of those interested, the following subjects are indicated as suitable, but other matters can, if desired, also be dealt with:—

1. Selection of stock.
2. Housing and runs.
3. Incubation: natural and artificial.
4. Brooder management and care of hen and chicks.
5. Growing stock.
6. Rearing on a large scale; systems.
7. Killing and marketing.
8. Production of eggs, testing, preserving, marketing.
9. Farm poultry.
10. Breeds for utility and exhibition.
11. Selection and mating; records.
12. Standards and judging; points.
13. Diseases; treatment and prevention.
14. Internal and external parasites; prevention and extermination.
15. The foods of the country and how to utilise them.
16. *Post-mortem*, with explanations.

Progressive courses of instruction can also be arranged.

The Tobacco Industry

The appointment has recently been made of an officer, Mr. W. H. Taylor, as tobacco and cotton expert.

Advice upon all matters appertaining to culture, curing and marketing of tobacco will be furnished on application to him, and he will be also available to visit farms, attend meetings and deliver addresses on the subject.

The possibilities of cotton growing demand attention, and Mr. Taylor will undertake investigation of this question. All interested in this subject also are invited to communicate with him at the Department of Agriculture, Salisbury.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 61. Requirements in sending Botanical Specimens to the Department for Identification.

No. 62. Services of Agricultural Engineer.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.

No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.

No. 90. Reports on Experiments—Experimental Station, Salisbury, 1910-1911, by J. H. Hampton.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 134. Plans and Specifications for Flue Curing Tobacco Barns.

No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.

No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.

No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultural Engineer.

No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.

No. 177. Notes on the Raising of Seedling Trees, by F. B. Willoughby.

No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.

No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.

No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W. M. Watt.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 217. Windbreaks and Hedges, by F. B. Willoughby.

No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 222. Costs of Farm Operations, Gwebi.

No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.

No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.

No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.

No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.

No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 257. Maize Grading, by J. A. T. Walters, B.A.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 260. Rhodesian Farm Orchard, by A. G. Turner.

No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 269. Farming in Granite Country, by R. C. Simmons.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 296. Citrus Nursery Work, by A. G. Turner.

No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.

No. 305. Manure Supplies, by E. V. Flack.

Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.

No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.

No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.

No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.

No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.

No. 179. Buckwheat, by H. G. Mundy, F.L.S.

No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.

No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.

No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.

No. 194. Rye, by J. A. T. Walters, B.A.

No. 199. Eucalypts for the Farm, by J. J. Boocock.

No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.

No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

No. 232. Witch-Weed or Rooi-Bloem, by J. A. T. Walters, B.A.

No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.

No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.

No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.

No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.

No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.

No. 253. Wheat Production in Southern Rhodesia.

No. 258. Winter Wheat, by J. A. T. Walters, B.A.

No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.

No. 265. Rose Culture, by N. L. Kaye Eddie.

No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.

No. 285. The Mexican Marigold, by F. Eyles, F.L.S.

No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.

No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W Jack, F.E.S.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.

No. 140. Insect Pests of Tobacco in Southern Rhodesia, by R. W. Jack, F.E.S.

No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.

No. 147. Root Gallworn, by R. W. Jack, F.E.S.

No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.

No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.

No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.

No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.

No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.

No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R W. Jack, F.E.S.

No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.

No. 197. Chafer Beetles, by R. W. Jack, F.E.S.

No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.

No. 214. Some Household Insects, by R. Lowe Thompson, B.A.

No. 219. More Household Insects, by R. Lowe Thompson, B.A.

No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.

No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.

No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.

No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.

No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.

No. 280. The Maize Beetle, by R. W. Jack, F.E.S.

No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.

No. 291. Cutworms, by Rupert W. Jack, F.E.S.

No. 295. Tsetse Fly in Southern Rhodesia, 1918, by Rupert W. Jack, F.E.S.

No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 65. Common Ailments of the Horse, by D. R. Chatterley, M.R.C.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.

LIVE STOCK.

No. 145. Prospects for Importation of Cattle from Australia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 205. Home Butter Making, by R. C. Simmons.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.
No. 242. Construction of Dipping Tanks (Revised).
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 282. Management of Dipping Tanks, by J. M. Sinclair, M.R.C.V.S.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 299. Grading, Classifying and Mating Poultry, by Arthur Little.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs. Ph.D., B.Sc., Director of Agriculture.
No. 157. Hints on Brickmaking, by G. T. Dyke.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 226. Classification of Clouds.
No. 237. The Analysis of Agricultural Products, Soils, Water, etc.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 266. Directory of Farmers. (Price 1s.)
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Game Law: Summary of.
Terms for Analysis by the Department of Agriculture, of Produce, Soils, Water, etc

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Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

F. J. W.—Farmer's son, age 18, with three years' commercial experience, handy with tools, seeks place as learner on good general farm. Three months' service in return for board; afterwards small salary.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 473 of 1918.] [13th December, 1918.

IT is hereby notified that His Honour the Administrator has been pleased, under the powers vested in him by the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notices Nos. 442 of 1914, 410 of 1915, 12, 172 and 296 of 1916, and 328 of 1918, and to appoint the under-mentioned persons to issue permits for the movement of animals in terms of section 22 (1) of the said Ordinance :—

Clerks in the Native Department at :—

Hartley
Mazoe
Sinoia
Marandellas
Mrewa
Rusape
Inyanga
Melsetter
Chipinga
Umvuma
Que Que
Selukwe
Belingwe
Fort Rixon
Umzingwane
Inyati
Fort Usher
Plumtree
Nyamandhlovu
Gwanda

Members of the B.S.A. Police at the following stations :—

Banket
Beatrice
Enkeldoorn
Figtree
Filabusi
Holi
Headlands
Makaha
Makwiro
Mphoengs
Sipolilo
Tuli
Wedza
Marula
Liebig's Drift

The Postmaster, Macheke.

The Magistrate's Clerk, Gatooma.

No. 18 of 1919.] [17th January, 1919.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 177 of 1918, declaring an area of infection and guard areas in the Mrewa native district.

No. 24 of 1919.] [17th January, 1919.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 227 of 1918, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard areas in lieu thereof :—

1. Melsetter Native District.

(a) *Area of Infection.*

The farm Woodstock.

(b) *Guard Area.*

The farms Gwendingwe, Zebra, Brackenbury, Highlands, Joppa, Merrywaters and Cecilton.

2. Umtali Native District.

(a) *Area of Infection.*

The farm Engwa.

(b) *Guard Area.*

An area bounded by and including the farms Reserve, Minyinga South, Minyinga North, Marapara, Wengezi Valley; thence from the south-western beacon of the latter down the western boundary of Inyaruparu farm to the Umtali-Melsetter road; thence northward along this road to the northern boundary of Stewarton North; thence along this boundary to Clydesdale; thence along the north-western boundary of Clydesdale, the northern boundary of Mazonwe and the northern boundary of Brown Hill to its north-east beacon on the Portuguese boundary; thence southward along this boundary to the south-east beacon of Reserve.

No. 468 of 1918.] [13th December, 1918.

APPLICATIONS FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
Methodist Episcopal Mission	Odzani	Umtali	Farm Old Town
Director of Agriculture	Inyongombie	Inyanga	Farm Withington (Rhodes Inyanga Estate)
W. A. Beattie ...	Zadzi	Chilimanzi	Farm Cairngall

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications, together with a full statement of the grounds for such objections.

No. 7 of 1919.] [3rd January, 1919.

APPLICATIONS FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
M. J. Grove ...	Unnamed	Inyanga	Farm Mt. Pleasant
F. Davis ...	Umtali	Umtali	,, Gloucester
J. McCormick ...	,,	,,	,, Mt. Wolseley
J. Haslam ...	,,	,,	,, Brooksville
A. Marton ...	,,	,,	,, Battery Spruit
J. L. Howie ...	,,	,,	,, Cairndhu

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications, together with a full statement of the grounds for such objections.

No. 8 of 1919.] [3rd January, 1919.

IT is hereby notified that His Honour the Administrator has been pleased to cancel so much of Government Notice No. 420 of 1917, dated 2nd November, as grants the right to the British South Africa Company to divert, impound, take and use public water from the Mazoe River, and to impound, store and use storm and surplus water on their land at the site known as the Mazoe Poort, for the irrigation of riparian land on the farms known as the Mazoe Citrus Estate, in the district of Mazoe, and to substitute in lieu thereof the following grant to the said Company of the use of water as follows :—

Under and by virtue of the powers conferred upon me by sub-section (4) of section 16 of the "Water Ordinance, 1913," I do hereby authorise the British South Africa Company to divert, impound, take and use public water from the Mazoe River, and to impound, store and use storm and surplus water on their land at the site known as the Mazoe Poort, for the irrigation by them of riparian land on the farms known as the Mazoe Citrus Estate, in the district of Mazoe, on the following conditions :—

(1) That the storage dam shall be constructed by the British South Africa Company in such a manner and with foundations of such strength as will permit of the elevation of the storage dam to a height of 100 feet.

(2) That when there is a reasonable demand by other owners of land for the use of water from the said dam for irrigation purposes, in excess of what is required by the Company, the Company shall supply such excess water at a fair rate. Any dispute as to the reasonableness of such demand or as to the price of such water shall be referred to a Water Court for decision.

If in order to provide excess water as aforesaid it should be necessary to raise the elevation of the dam wall, the Company shall do so, provided the total elevation of the wall does not exceed 100 feet.

(3) That the said Company shall not impede the normal flow of the Mazoe River by the said impounding and storage.

Given under my hand and seal at Salisbury, this 16th day of September, 1918.

F. J. Newton,
Acting Administrator.

Administrator's Office,
Salisbury, 16th September, 1918.

Sealed in my presence this 16th day of September, 1918.

Colin E. Duff,
Acting Secretary,
Department of Administrator.

Note.—(1) The rights above granted shall lapse and be void if not used for a consecutive period of three years, if such failure to use is owing to the neglect or default of the person possessing such rights.

(2) The rights above granted are subject to any existing rights to water granted under the Mining Law, and shall not derogate from the right of miners to acquire water thereunder.

No. 19 of 1919.] [17th January, 1919.

IT is hereby notified that His Honour the Administrator has been pleased to make the following grants under the "Water Ordinance, 1913" :—

1. To *Abraham Blumenthal*, in respect of the land known as The Grange Farm, in the district of Umzingwane, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use three-fourths of the public water in the Lumane River measured at the upper boundary of the said farm, for the irrigation by him of his riparian land on the said farm, subject to the following conditions :—

(1) That in this grant three-fourths of the public water shall mean three-fourths of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm The Grange, in extent approximately 3,036 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the tenth day of August, one thousand nine hundred and eighteen.

2. To *Annie Weitsz*, in respect of the land known as Doornhoek Farm, in the district of Inyanga, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use two-thirds of the public water of an unnamed stream entering the said farm on its south-east side, as measured at the intake of the irrigation furrow existing in August, 1918, for the irrigation by her of riparian land on the said farm, subject to the following conditions :—

(1) That in this grant two-thirds of the public water shall mean two-thirds of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Doornhoek, in extent approximately 1,430 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the second day of October, one thousand nine hundred and eighteen.

3. To *Robert George Garvin,* in respect of the land known as Virginia and Sleamish Farms, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-half of the public water in the Mazoe River, measured at any point between the existing railway bridge on his farm Virginia and the upper boundary of the farm Sleamish, for the irrigation by him of his riparian land on the said farms, subject to the following conditions:—

(1) That in this grant one-half of the public water shall mean one-half of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farms Virginia and Sleamish jointly, in extent approximately 7,000 acres. On any sub-division of the farms this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the second day of October, one thousand nine hundred and eighteen.

4. To *William Johnston Biggs,* in respect of the land known as Collingwood, sub-division B, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-half of the public water in the Garanapudzi River, measured at the upper boundary of the said farm, for the irrigation by him of his riparian land on the said farm, subject to the following conditions:—

(1) That in this grant one-half of the public water shall mean one-half of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Collingwood, sub-division B, in extent approximately 569 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the second day of October, one thousand nine hundred and eighteen.

5. To *Alfred James Doyle,* in respect of the land known as Georgia Farm, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-third of the public water in the Mazoe River, measured at the upper boundary of the said farm, for the irrigation by him of his riparian land on the said farm, subject to the following conditions:—

(1) That in this grant one-third of the public water shall mean one-third of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Georgia, in extent approximately 978 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the second day of October, one thousand nine hundred and eighteen.

6. To *Thomas Benjamin Hulley*, in respect of the land known as Shigodora Farm, in the district of Umtali, under the powers conferred by the "Water Ordinance, 1913," the right to impound and store storm water from the Nyachua River for the irrigation of certain land and for the generation of power on the said farm.

The said storm water shall be stored in a reservoir constructed above the waterfall at the lower end of the said farm, and the height of the retaining dam shall not exceed twenty feet above the level of the river bed.

It is a condition of this grant that the said impounding and storage shall not impede the normal flow of the Nyachua River, as measured at the point where the river enters the said reservoir basin.

This grant is issued in respect of the whole of the farm Shigodora, in extent approximately 1,419 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

Dated the second day of October, one thousand nine hundred and eighteen.

7. To *Thomas Benjamin Hulley*, in respect of the land known as Shigodora Farm, in the district of Umtali, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use the whole of the public water in the Nyachua River, at the point of intake at the upper boundary of the said farm, for the irrigation of riparian land on the said farm, subject to the following conditions :—

(1) That in this grant the whole of the public water shall mean the whole of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Shigodora, in extent approximately 1,419 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the second day of October, one thousand nine hundred and eighteen.

8. To *The Estate of the late Michael Reimer*, in respect of the land known as Stuhm Farm, in the district of Salisbury, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use the whole of the public water in the Umturi River, measured at the upper boundary of the said farm, for the irrigation of riparian land on the said farm, subject to the following conditions :—

(1) That in this grant the whole of the public water shall mean the whole of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Stuhm, in extent approximately 1,280 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the seventh day of October, one thousand nine hundred and eighteen.

9. To *Peter Slement*, in respect of the land known as Edendale Farm, in the district of Hartley, under the powers conferred by the "Water Ordinance, 1913," the right to divert, take and use such quantity of public water from the Umfuli River as can be beneficially used for the irrigation of crops on 75 acres of land riparian to the right bank of the said river on the said farm, subject to the following conditions :—

(1) That in this grant such quantity of public water shall mean such public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Edendale, in extent approximately 1,477 acres. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water above specified.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the fifteenh day of October, one thousand nine hundred and eighteen.

10. To *Reginald Herbert Dickson,* in respect of the land known as Hoboken Farm, in the district of Umtali, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-fifth of the public water in an unnamed stream entering the said farm near its south-west corner, measured at the upper boundary of the said farm, for the irrigation of riparian land on the said farm, subject to the following conditions :—

(1) That in this grant one-fifth of the public water shall mean one-fifth of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Hoboken, in extent approximately 1,922 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the thirtieth day of October, one thousand nine hundred and eighteen.

11. To *The British South Africa Company,* in respect of the land known as Tatagura Reserve Farm, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-third of the public water in the Tatagura River, measured at the upper boundary of the said farm, for the irrigation of land riparian to the said river on the said farm, subject to the following conditions :—

(1) That in this grant one-third of the public water shall mean one-third of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Tatagura Reserve, in extent approximately 2,440 acres. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the thirtieth day of October, one thousand nine hundred and eighteen.

12. To *William Brunsdon Colling*, in respect of the land known as Esperanza Farm, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-third of the public water in the Umrodzi River, measured at the upper boundary of the said farm, for the irrigation by him of his riparian land on the said farm, subject to the following conditions :—

(1) That in this grant one-third of the public water shall mean one-third of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Esperanza, in extent approximately 900 acres. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the thirtieth day of October, one thousand nine hundred and eighteen.

13. To *Andries Jacobus Smit* and the *Estate of the late Gerhardus Petrus Bothma*, being joint owners of the undivided farm Cheshire, in respect of the said farm Cheshire, in the district of Inyanga, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use the whole of the public water in an unnamed stream, as measured at the point where the said stream enters the eastern boundary of the said farm adjoining the farm Doornhoek, for the irrigation of land on the said farm Cheshire riparian to the said stream, subject to the following conditions :—

(1) That in this grant the whole of the public water shall mean the whole of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Cheshire, in extent approximately 1,490 morgen. On any sub-division of the farm this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the fifteenth day of November, one thousand nine hundred and eighteen.

14. To *John Strachan*, in respect of the land known as Yarrowdale Farm, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use three-fourths of the public water in the Little Mazoe River, measured at the upper boundary of the said farm, for the irrigation of land riparian to the said river on the said farm, subject to the following conditions :—

(1) That in this grant three-fourths of the public water shall mean three-fourths of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Yarrowdale, in extent approximately 2,520 acres. On any sub-division of the land this grant shall be subject to revision, in order to secure an equitable distribution of water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the second day of December, one thousand nine hundred and eighteen.

No. 17 of 1919.] [17th January, 1919.

ORCHARDS INSPECTION REGULATIONS.

IT is hereby notified that His Honour the Administrator has been pleased, under the powers conferred on him by section 1 of the "Orchards Inspection Ordinance, 1914," to declare for the purposes of the said Ordinance :—

1. The following fruit-bearing plants to be fruit trees :—

   All varieties of citrus trees, apple, pear, quince, medlar, peach, nectarine, apricot, almond, plum, prune, grape and fig.

2. The following to be pests :—

   (1) Citrus canker (*Pseudomonas citri*, Hasse).

   (2) Pernicious scale (*Aspidiotus perniciosus*, Comst).

A Herd on a Rhodesian Ranch.

THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture,

assisted by the Staff of the Agricultural Department.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

THE CONGRESS.—The Annual Congress of the Agricultural Union, held in Salisbury on 17th to 20th March, was remarkable both for the number of useful resolutions passed and for the general tone of the debates. During recent years a considerable improvement has been noted in the manner in which subjects brought forward have been dealt with, a change which has quickly been appreciated by the public. Last year the handling of the question of the industrial employment of the native caused much favourable comment, and this year a high level of discussion marked the consideration of several subjects, notably

the dipping of cattle, land settlement, experiment farm for the sand veld, export of cows, export of produce and co-operation. On some topics discussion was heated and unrestrained, with consequent loss of force and failure to convince a patient but critical audience. There was a marked feeling of "sweet reasonableness" and of fair play which go far to give weight to the discussions and decisions of such a representative gathering. The Congress next year is to be held at Gwelo.

THE BULAWAYO SHOW.—The Bulawayo Agricultural Society hold their twelfth annual show on 26th, 27th and 28th May, and this show promises to eclipse the excellent exhibits of last year. With a three days' show the committee hope to be able to allocate more time to lectures and demonstrations, and thus increase the educational value of the show. A sale of breeding stock will be held on Thursday, 29th May, and the animals already entered for this sale form a very fine selection indeed. Those requiring ranching and dairy stock will be able to make their choice from the animals offered. Entries close for the sale on 12th April and for the show on 10th May. The sale catalogue will be ready a few days after the closing of entries, and the secretary of the society, P.O. Box 244, Bulawayo, will be glad to supply copies to those interested. The society will publish as full pedigrees as possible in this catalogue, and have arranged for copies to be obtained from the various breed societies in the south. By this means they hope to attract purchasers from the Union. A committee of inspection has been appointed to pass all animals entered for the sale; this will help to safeguard the interests of purchasers. The second show of fat stock, maize, produce and needlework will be held on 2nd September. Copies of the May and September prize lists can be obtained from the secretary.

BREEDERS' SOCIETIES.—It is announced that the annual general meeting of members of the Shorthorn Society of South Africa will be held at Bloemfontein on Tuesday, 8th April, at eight o'clock. The membership of this body now stands at 303, of whom 50 are in Rhodesia.

The annual general meeting of the Devon Cattle Breeders' Society of South Africa takes place, also at Bloemfontein, on Saturday, 11th April, at eight o'clock, when, amongst other matters, a proposal will be made for holding this meeting in alternate years in Bloemfontein and Bulawayo, a clear indication of the interest in this breed in Rhodesia.

FRIESLAND CATTLE FOR BULAWAYO SHOW.—We are pleased to hear that the Friesland Cattle Breeders' Association of South Africa has decided to send up from the Union, for exhibition at the Bulawayo show in May, a representative group of this great dairy breed. The selection

will consist of eight fully registered Friesland bulls and four registered cows and heifers from various districts of the Union. In addition, it is proposed to exhibit a pair of pure-bred Friesland oxen.

The object of the association is to bring prominently before breeders the merits of Friesland cattle, which, owing to their special capacity as milk producers, are thought to be particularly suitable for the use of small holders as the closer settlement of the country advances, and at the same time to demonstrate the possibilities of beef production on mature bullocks.

It is not proposed to take any of the cattle back to the Union. The oxen will be sold for slaughter and the breeding cattle will be put up to auction. Rhodesian breeders will appreciate this opportunity for introducing some of the best blood into their herds. We regret that photographs of these animals did not arrive in time for reproduction in this issue of the *Journal.*

FARMERS' CO-OP., LIMITED.—The directors of the Farmers' Cooperative Society have now issued a prospectus for a new company, and the subscription list is open. This flotation is of great interest to farmers, for the promoters believe that the conversion of the old Co-operative Society into a limited liability company will be of much advantage to grain growers in particular, besides benefiting the farming industry generally.

The first object of the new company is to take over the business of the Farmers' Co-operative Society as a going concern. It is proposed to extend that business in several directions, including a bacon factory, a creamery, and the dealing in live stock. The company also intends to act as general merchants to buy and sell requisites for members, and generally to extend the work on co-operative lines for the benefit of shareholders. An important proposal is the establishment of buying and selling agencies in Rhodesia, overseas and elsewhere. If this branch is properly developed, it should have a stimulating effect on production in many directions, by bringing the farming community into direct touch with markets the world over. The company will also be prepared to act as bankers for the shareholders, and this section includes the attractive offer to pay interest on current accounts as well as on fixed deposits.

Although the company will possess limited liability under the Companies Ordinance, it will continue to work on a truly co-operative basis. The amount of interest payable to shareholders as such is limited to a maximum of 10 per cent., the balance of other net profits being divisible *pro rata* to the amount of produce supplied to the company, and provision is made in the articles of association to prevent the control of the business ever passing out of the hands of the producing shareholders.

If this flotation proves to be the success anticipated, the example will probably be followed by other co-operative associations in Rhodesia.

NITRATE OF SODA.—We learn from the Chilian Nitrate of Soda representative at Bloemfontein that supplies of this necessary and valuable fertiliser are again freely available for agriculture. For a long time supplies have been practically unobtainable. Though no local price is quoted, it is interesting to learn that the Associated Producers of Chilian Nitrate are offering the ordinary nitrate of soda at 10s. per quintal, and refined at 10s. 6d. per quintal, delivered free alongside vessel at Chilian ports.

The Ear Tick.

During the past few years a new tick, a native of America, *Ornithodorus megnini*, has made its appearance in South Africa, and has spread, more especially over the drier parts of the country, though it is also met with in the coast belt. It is not as yet known in Rhodesia, but may any time be introduced, so that stock-owners should be made aware of its existence and of remedial measures. This tick attacks all domestic animals and occasionally man himself, but is chiefly noticed in calves, and always invades and inhabits only the ear.

Its occurrence and life history have been made the subject of special study by Messrs. Cooper & Nephews, of dip fame, who have made a special preparation, Cooper's Ear-Tick Remedy, for destroying this tick. It is applied by means of an ingenious device, the Cooper pourer, into the ear. Those interested in this new tick should apply to Messrs. Wm. Cooper & Nephews, P.O. Box 4557, Johannesburg, for their pamphlet descriptive of this pest, which furnishes full and interesting particulars of its appearance, habits and means of extirpation.

Inoculation of Cattle against Redwater and Gall-sickness.

By Ll. E. W. Bevan, M.R.C.V.S., Fellow of the Society of Tropical Medicine and Hygiene, Government Veterinary Bacteriologist.

It is well known that when cattle in Southern Rhodesia are submitted to the bite of certain ticks they contract redwater and gall-sickness, and that such animals on recovery harbour indefinitely the parasites of these diseases in their blood, thus becoming a constant source of infection for ticks subsequently feeding upon them. The parasites thus taken up by an adult blue tick pass through each of the many thousands of eggs laid by her to the larvæ or "seed ticks" hatching from them, which in turn transmit them to cattle upon which they feed. In this way most bovines born in this country sooner or later become infected.

The names redwater and gall-sickness are based upon the most prominent symptoms manifested in the acute forms of the diseases, but the chronic or sub-acute types, which are more common and might be referred to as "tick fevers" or "tick-anæmias," are not generally recognised. The severity of these maladies is modified by the age and breeding of the animal at the time of the first infection, native breeds suffering less severely than imported stock and their crosses. As is well known, the great majority of the latter exposed to natural infection succumb to these diseases, or are so severely affected that their vigour and usefulness are impaired. This seriously affects the progress of the stock-raising industry. Our indigenous cattle, while hardy and prolific, are small and slow to mature, and need to be graded up to the necessary standard required by the meat markets of the world; this can only be achieved by the use of good quality bulls, of which, on the basis of other stock-raising countries, we are at least 5,000 short of immediate requirements.

But our native stock, although markedly resistant and infected at an early age, are also harmfully affected by the presence of these parasites in their blood, which produce their ill effects in the following ways:—

1. By interfering with the circulation of the blood.
2. By destroying the blood cells.
3. By robbing the host of nutritive material.
4. By producing substances toxic or poisonous to the host.

Now, the blood is the fluid medium by means of which the tissues of the body are nourished, and if the animal is deprived of blood, either in quantity or quality, it cannot maintain a healthy condition. Animals require blood not only for maintenance, but also an excess for growth; if this is denied them, they cannot develop.

The losses due to these diseases, therefore, are enormous, and may be summarised as follows:—

1. Death of imported stock; shortage of bulls for improvement of local stock; loss of service to cows; unsatisfactory calves from imported stock.
2. Heavy mortality in young stock from these and associated diseases (scour, etc.).
3. Loss of growth and delayed maturity.
4. Loss of milk and dairy products.

On the basis of 10s. per head, the national loss from these causes well exceeds the enormous sum of half a million pounds a year.

The final remedy for these difficulties will probably be found in the total eradication of the blue tick by short-interval dipping, but until this has been systematically and universally applied for some considerable time, there will be a period of transition during which the tick and the diseases transmitted by it must persist in certain parts of the country. Moreover, it must be remembered that, when ticks are totally eradicated from an area, the live stock born and reared on it remain susceptible and contract a virulent type of the diseases if exposed on "undipped" veld. Thus it happens that those stock-owners who have for some time past consistently dipped their cattle are at present and must for some considerable time be at a disadvantage. By eliminating the ticks their cattle grow up free from and susceptible to tick-borne diseases, and if infection is delayed until they have outgrown the natural resistance associated with youth, they may suffer as severely as animals imported from tick-free countries. As the result of dipping, these men have been able to import cattle from overseas for the improvement of their stock, and, these animals having lived, they have so graded up their herds that the resistant qualities peculiar to indigenous stock have to a large extent been eliminated. It has been shewn by laboratory experiments, and proved by practical experience, that the virulence of redwater and gall-sickness becomes greatly increased by passage through cattle of improved types. Thus, if blood is taken from a native animal and inoculated into a young imported beast, the latter will contract these diseases more or less severely, but, if the blood of this imported animal is inoculated into another imported animal, the latter in all probability will die of a very severe form of infection. In this way, if by accident infected ticks are introduced to a dipped farm and infect the improved stock on it, the virulence of the disease is of exceptional severity, and the mortality higher than in herds in which native blood predominates.

Again, should the stock reared on a dipped farm be moved to infected veld, they are likely to contract tick-borne diseases; so that the man who has succeeded, at considerable trouble and expense, in

rearing valuable young animals of high quality finds to his cost that the market for such animals is limited because of the risk of infection after purchase by stock-owners who have been less progressive in cleansing their farms.

Although dipping as a panacea for all tick-borne diseases has been preached by the Veterinary Department for many years, the transition stage through which we are now passing has been foreseen, and for the last ten years preparations have been made to cope with it. The solution of the problem has been sought in the discovery of a successful method of immunising not only imported animals, but also young stock, against tick-borne diseases, with as little damage as possible to the treated animal. After careful work and observation, it is hoped that such a method has been found.

It will be remembered that in the pre-dipping days at least 90 per cent. of all cattle imported for the improvement of our local stock succumbed. From 1909 onward attempts were made to immunise bulls introduced from overseas by inoculating them with blood containing parasites of low virulence, but, as little was known concerning the principles governing the attenuation of the virus, the results were sometimes disastrous. However, as the result of painful experience, a more or less satisfactory strain was arrived at, and in 1911 a large inoculation camp was established at Letombo, when 66 bulls from Great Britain were inoculated, including the famous animals "Peerless," "Baronet," "Aerial Knight" and others, which have since produced such beneficial effects upon the herds of this country. In the following year a large consignment of over 70 animals was treated, but the results were somewhat unfortunate, as the subjects for inoculation included old cows heavy in milk, heifers in calf, and highly-bred pampered bulls "rolling in fat," which were only inoculated after their unsuitability had been pointed out to their owners. In the following year the Letombo camp was closed down, and a few animals were treated at the stables at the laboratory, but the results shewed that the accommodation there was unsuitable, and for several years the inoculation of cattle was not undertaken except upon an experimental basis with a view to obtaining a safer and more suitable method.

During the year 1918 a new inoculation camp was established as part of a scheme laid down for a Veterinary Research Station, and excellent and up-to-date stabling was erected for the accommodation of 29 animals. In the meantime great progress had been made in the selection of a vaccine, and it is hoped that, given suitable animals, immunisation can be accomplished with the least possible ill effects.

The qualifications which render an animal suitable for treatment are:—

1. It should not exceed fifteen months of age.
2. It should not be fat, forced or pampered.
3. Its breeding should not have been such as to have weakened its constitution.
4. It should be delivered at the inoculation camp in good health, and free from ticks.

5. Females should not be pregnant, and cannot be treated except under guarantee that they are not in calf.

It is proposed to charge a small fee to cover the cost of feeding, handling and treating the animals, and it is hoped that results will soon justify the creation of an insurance fund to cover owner's risk, so that he may present his bull at the camp for inoculation, and return for it or its value after a period of six weeks, during which time the animal will have been rendered thoroughly immune against the diseases under discussion. It is fully recognised that this system involves a certain amount of expense and inconvenience to the stock-owner, and every effort will be made to improve the method of inoculation so that it can be applied by the farmer himself, on the farm, without risk to the animal, and yet will convey strong and lasting immunity.

A great deal of distrust and misconception exists concerning the results of inoculation of imported stock, it being asserted that the operation interferes with the growth, fertility and usefulness of the animals. Much of this is not supported by fact, and after careful enquiry it has been found that, where inoculated animals have failed to give satisfaction, the fault has often been due to the carelessness and incompetence of the owner, against which no method of inoculation has yet been devised. It is most necessary that valuable animals exposed to new conditions of climate, diet and mode of living should be given a fair chance. On circularising the owners of many of the inoculated animals, favourable reports were received from the majority, sufficiently enthusiastic to quite counter-balance the adverse criticism of the less fortunate. The following record of the famous bull "Prince Worcester," which was inoculated in 1913, is in itself sufficient proof that the process can be applied without injury to the animal. The performances of this bull in the show ring are in no respect better than those of many other animals on the ranch or in the dairy.

"Prince Worcester" was recently purchased from Mr. G. C. Woodforde, of Gatooma, by the British South Africa Company's Estates Department for their Shangani Estate, for the sum of £500. This bull is by "Adbolton Prince," *ex* "Duchess of Barrington 84th," is seven years old, was bred by Mr. James Horlick, of Cheltenham, England, and was imported in 1913. The show record of this bull is as follows:—

1914, Gwelo.—Second prize in open class for Shorthorn bulls.

1915, Bulawayo.—First prize for Shorthorn bulls in open class, three years old and over.

1916, Bulawayo.—Reserve for One Thousand Guinea Trophy; championship, Shorthorn Society's Challenge Cup; reserve champion, best Shorthorn bull in yard; second prize for Shorthorn bull, three years old and over. At this show an unregistered fifteen-months-old calf by "Prince Worcester," "Lanteglos Advocate," won the cup for the best Rhodesian-bred bull, and was second in open class for South-African-bred bulls. This young bull was sold for £145.

1916, Salisbury.—Championship, best Shorthorn bull in yard; championship, best bull in yard; first in class, three years old and over.

1916, Gwelo.—Championship Gold Medal.

1917.—Shewn only at Gatooma show, and was unbeaten. At head of family group of Shorthorns which beat the Shangani group, the winners in this class at Bulawayo in that year.

1918, Bulawayo.—First in class for Shorthorn bulls of three years old and over.

1918, Salisbury.—Championship, best Shorthorn bull in yard; championship, best bull in yard; championship, first in class for Shorthorn bulls of three years old and over.

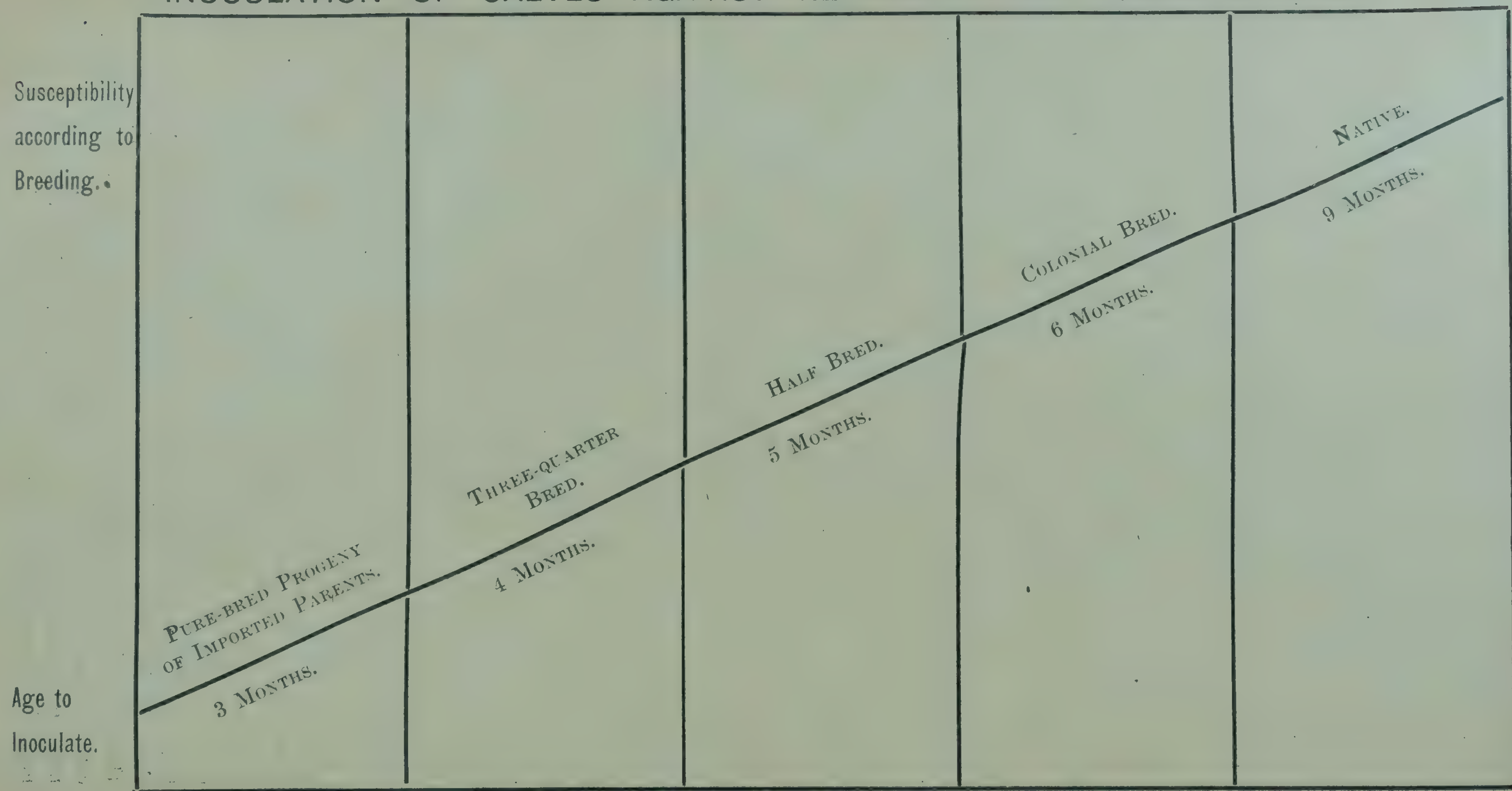
The difficulties and disadvantages associated with the breeding of cattle on dipped areas can also be dealt with by inoculation of young stock, a method having been evolved dependent upon:—

1. The selection of a strain of infection of low virulence.
2. The innate resistance of young cattle, and the gradual loss of such immunity.
3. The varying susceptibility of different breeds of cattle.

As has been pointed out, the virulence of a strain of redwater and gall-sickness is modified by passage through different breeds of cattle, being lowest in animals of indigenous breeds and increasing in strength by transmission through animals of exotic or imported types. By careful selection and sub-inoculations extending over a period of ten years, a strain of comparatively low virulence has been obtained, but not so mild as to be inert when applied to suitable animals. It is a matter of considerable importance that the inoculated animal shall contract the disease, inasmuch as it is only by recovery from infection that immunity is established. But since young animals possess at birth, and for some time after, according to their breeding, an appreciable degree of resistance, the inoculation must not be performed too early, that is before they become susceptible and subject to infection, or too late, when the re-action may be severe and retard their development.

The following diagram indicates approximately the age at which calves of different breeds should be inoculated. It is not based upon any hard or fast rule, but is subject to modification which will readily be appreciated by any practical stockman. Thus a delicate, weedy calf would naturally offer less resistance than one of robust constitution, and should be inoculated at an early age; and the progeny of highly bred and delicate parents should be submitted to treatment younger than calves from coarser types. The main object to aim at is to give the infection at the earliest age at which the calves are likely to re-act. However, the virus is so mild and the re-action so harmless that a certain degree of latitude may be given in order that the stockman may select the most favourable season, and draft his calves for treatment in numbers and at times to suit his convenience.

INOCULATION OF CALVES AGAINST RED-WATER AND GALL-SICKNESS.



INOCULATION OF CALVES

AGAINST RED-WATER AND GALL-SICKNESS.

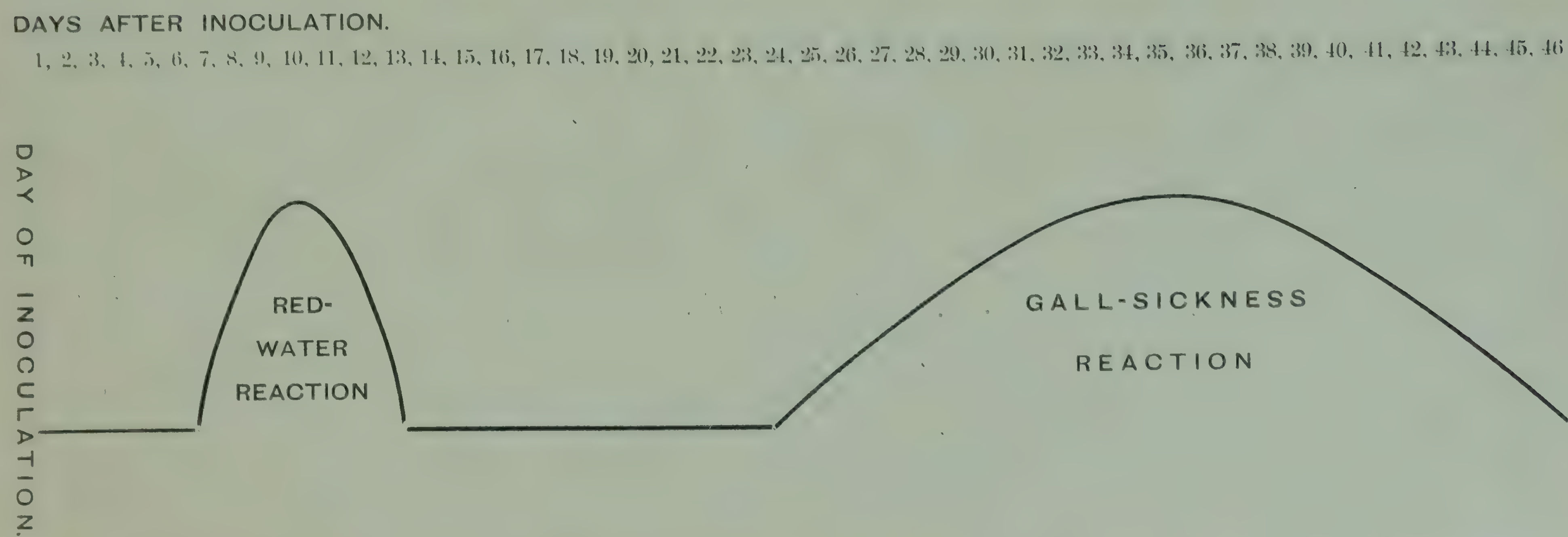


DIAGRAM SHEWING THE PERIODS DURING WHICH REACTIONS MAY BE EXPECTED.

After inoculation two periods of re-action may be expected, the first during the second week, the second occurring during the second month after inoculation. The first is caused by redwater, the second by the gall-sickness parasite. During these periods the animal may be slightly dull and feverish, and may become a little anæmic and "out of sorts." Highly susceptible animals may pass a little red-coloured urine during the first re-action, or may become slightly yellow or jaundiced during the second. During these periods the animals should be carefully protected from exposure to extremes of heat or cold, wind or rain. They should be allowed to receive their mothers' milk in small quantities at a time, but at frequent intervals. Hand-reared calves or calves of poor mothers should receive a suitable calf diet. The following may be taken as a guide:—

Ration for a Calf 160 *to* 200 *pounds live weight.*

Mealie meal	90%	Mixture per day, $1\frac{1}{2}$ pounds
Crushed linseed ...	10%	
Skim milk		13 to 18 pounds per day
Hay		about 3 pounds

The actual operation of inoculation is extremely simple, consisting of the injection of a certain quantity of virus under the skin of the calf's neck. The virus must be used within forty-eight hours after despatch from the laboratory. It has been ascertained by numerous tests and experiments upon calves of different types what re-actions may be expected, and it is confidently believed that if stock-owners will carefully carry out the instructions given, and will use a certain amount of common sense in selecting and tending the calves under treatment, the "set back" to the animals will be inappreciable, and their market value not reduced, but considerably enhanced. Moreover, inoculated stock will be free from the risks of infection when exposed on tick-infested veld, and a greater freedom of movement and a wider market for sale will be available for them.

Maize Culture on Red Soil.

VALUE OF POISONED BAIT AS AN AID TO GOOD STANDS.

By Rupert W. Jack, Government Entomologist.

The difficulty of securing really good stands of maize, especially on the red soils, will be admitted by most Rhodesian maize growers. From observations extending over a series of years, the writer has formed the opinion that the average stand of vigorous plants on such soil lies somewhere between 60 per cent. and 70 per cent.; and is probably nearer the former figure. This estimate is independent of sporadic calamities, such as severe outbreaks of cutworms, or the maize beetle (*Heteronychus mashunus*), flooding, washaways, hail, etc. It represents the stand from which the average red soil crop yielding from six to seven bags per acre is raised.

Although farmers generally appear to be aware of this shortage, comparatively few realise the main cause. It is customary to attribute it to faulty planting, faulty germination, or both combined. It may be said at once, however, that whilst a perfect planter has not yet been invented, and adverse weather conditions may affect the germination of the seed, these factors are not generally responsible for the poor stands secured. The fact of the matter is that a very much larger percentage of plants appear above ground than finally become established, and in the meantime a thinning out process of greater or lesser intensity has been in operation. Needless to say, the agents in this work of destruction are mainly insect pests. Where the loss is more or less overwhelming, or considerable patches are left bare, the farmer is usually aware of the nature of the injury he is suffering, but, as under ordinary conditions the loss is distributed throughout the land, the cause is commonly overlooked.

The position is clear enough when it is realised that the soil within a few inches of the surface supports a considerable insect population in an immature condition during the dry season, and that the adults, many of which are plant feeders, commonly emerge at or shortly after the commencement of the rains. The plant feeders on clean ploughed ground find themselves in a veritable desert before the appearance of the crop, and the young shoots, as soon as they appear above ground, are immediately attacked by the hungry insects just at the time the plants are least able to resist attack, and numbers may be destroyed before they have shewn more than a tender shoot above the surface. The destruction is not, however, confined to the first tender shoots that shew above ground. A certain proportion of the seed may be devoured

or injured in the ground, the shoot be destroyed before it reaches the surface, or the plants be demolished completely when they have attained a few leaves. Injury may, of course, occur even later, but the present note aims only at describing forms of attack which affect the primary stand.

Injurious insects which occur in varying numbers on almost all red soil in Mashonaland and may affect the stand of maize are as follows:- (1) Surface Beetles (two species), namely, *Gonocephalum æquale* and *Emyon tristis*; (2) Snout Beetles (two species), namely, *Systates* sp. and *Tanymecus* sp.; (3) Field Crickets; (4) Grasshoppers; (5) Cutworms; (6) "Wireworms" (*Trachynotus* sp.). None of these are *specific* maize pests; that is to say, that none of them are dependent only upon this plant for their development. They would be equally prevalent on the ploughed land if it were planted regularly to almost any other crop, and as a matter of fact most of them are injurious to other crops when the opportunity occurs. With the exception of grasshoppers, and possibly crickets, these insects seem to flourish better under the conditions brought about by cultivation than under those of the natural veld. This is due to the greater looseness or penetrability of cultivated soils, and the fact that cultivation encourages the growth of weeds other than grasses. The value of these conditions to the majority of the pests mentioned above will be better appreciated if we take a glance at their method of development.

(1) *Surface Beetles.*—The two species involved have similar life histories. The eggs are laid loosely in the soil from late in March throughout the dry season, but in markedly reduced numbers after July. The larvæ or grubs feed upon dry vegetable matter in the soil, but will eat into dry seeds if these are available. The great majority of them have completed their growth by November, and change to the pupa (chrysalis) state in the soil, the adult beetles emerging within two or three weeks. The bulk of the beetles appear late in November or early in December, and live over until late in March before egg laying commences. The adult beetles alone are destructive to the maize crop; as a matter of fact, they alone are present in numbers when the crop is in growth.

(2) *Snout Beetles.*—The life histories of these insects are not known with any accuracy, but there is little doubt that the larva or grub state is passed in the soil, the grubs feeding upon the roots of certain weeds or native plants. The beetles are active at least as early as late November, and are commonly present on the land, hiding under clods, etc., before the crop is planted.

(3) *Field Crickets.*—Unlike the beetle family, these insects undergo but a slight change in the course of their development, the young on leaving the egg being more or less similar, except for the lack of wings, to the adults. There is also no resting or pupa state. The eggs are laid in the soil. The habits of the young are also similar to those of the adults, and they take the same food, which includes plant tissue, living and dead, and probably also living and dead insects. They live in holes in the soil, under clods, etc., and are sometimes sufficiently numerous to do a noticeable amount of damage.

(4) *Grasshoppers.*—The development of these insects is similar to that of the crickets. The eggs are laid in "pods" in the soil, and the young wingless hoppers are active from the start, feeding freely upon green vegetation. Some species, as that shewn at Fig. 7 on the plate, do not develop functional wings in the adult state. Others are good fliers. These insects usually invade the maize field from the surrounding veld, but the species which are incapable of flight are frequently present on the land at the time the crop is planted.

(5) *Cutworms.*—These are the caterpillars of certain species of night-flying moths. The female moths lay their eggs amongst succulent, low-growing vegetation, such as germinating weeds, and on these the young feed. Their feeding is commonly checked by cultivation of the soil previous to planting, and by the time the young maize plants appear the cutworms are in a hungry condition. As a rule they do comparatively little damage on well-drained red soils, owing to the lack of weed growth previous to planting, but some are almost always present and help to swell the total loss.

(6) "*Wireworms.*"—The insects which go under this name in Rhodesia are the young of certain species of the family Tenebrionidæ, of which the "tok-tokje" beetles are the most familiar examples. Most are denizens of the sand veld, but a species of Trachynotus is common on the red soils, and the larva is often injurious, though rarely to great extent. The female beetle lays her eggs in the soil during May, June, July and even later, and the young grubs, or "wireworms," feed during the dry season on dry vegetable matter or whatever plant life is available. When the maize seed is planted, they commonly eat into it during the process of germination, and so deprive the young plant of the reserve nourishment which enables it to make a vigorous start in life. The "wireworm" continues to feed throughout the rains, and is full grown some time in March, when it changes to a pupa in the soil, the beetles emerging in April.

All the insects mentioned above affect the *stand* of maize secured on the red soil year by year. There are quite a number of other pests which attack the crop, but they are either, as far as is known at present, of a sporadic nature, or else, as in the case of the Maize Stalk Borer, injure the plant after it has become established. The insects we are concerned with at present are the regular *stand reducers*, and in order to render their activities clear to the reader, their method of attack may be tabulated as follows:—

(1) Seed (before germination) is commonly destroyed by *surface beetles*, especially if planted in dry land when the rains are late. The beetles eat the heart out of the grain. Cutworms will do similar injury, and possibly also field crickets.

(2) Seed (after germination) may be injured by *surface beetles*, especially the Dusty Surface Beetle (*Gonocephalum æquale*), and also by "wireworms" (*Trachynotus* sp.) and cutworms; crickets are also suspected.

(3) Young shoot (in ground) is attacked by the same pests as the germinating seed.

(4) Young shoot (above ground); attacked by crickets, grasshoppers, cutworms, surface beetles and snout beetles.

(5) Young plant (up to about six leaves); chiefly injured by snout beetles, grasshoppers and cutworms.

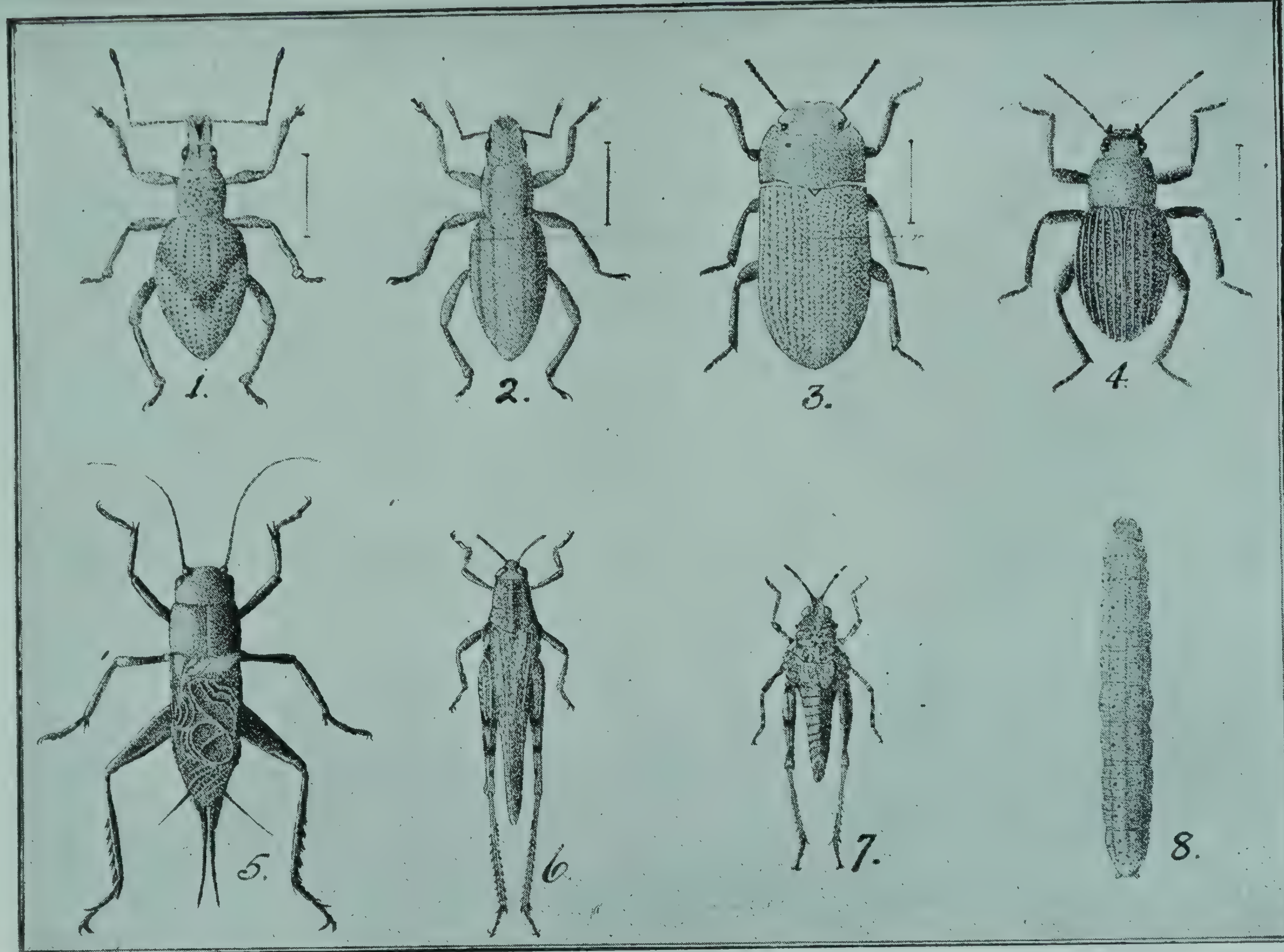
The extent of the ravages of these insects is not limited by the total of the plants actually demolished. When the germinating seed is partially eaten, the plant is generally so weakened that, although it may live, it is unable to produce a useful cob. Hundreds of these stunted plants are usually to be seen during a short walk through any field of growing maize on the red soil. Any considerable injury to a maize plant causes it to fall behind its neighbours, and, being overshadowed, it never has a chance to overtake the growth of the others, and probably does not produce a cob of much value; consequently, the damage wrought by insects which attack the plant in its young stages may be summed up as the percentage of plants actually destroyed, plus the percentage that do not cob owing to injury when young, plus the difference between the yield of plants that were injured in their growth and the yield they would otherwise have given. As a slight offset, we have the increased yield of individual plants on account of having greater space. Whilst estimates of this nature are always liable to error, the writer is inclined to place the average annual loss to the maize crop on red soil from insect attack at between 30 per cent. and 40 per cent. The figures may seem somewhat startling and improbable, but they are founded upon careful observation.

The question therefore arises: How much of this loss is it possible to save, and at what outlay? It may definitely be stated, in reply, that the *greater part of the loss may be avoided at a comparatively insignificant outlay.*

The remedy lies in the use of a poisoned bait consisting of a compound of arsenic with sugar or molasses in water, as follows:—

Arsenite of soda or paris green	1 pound.
Sugar (crude)	8 pounds.
or molasses	2 gallons.
Water	10 gallons.

The arsenite should be dissolved in a little boiling water, as it dissolves but slowly in cold water, and added to the sugar or molasses solution. If paris green is used, it only needs mixing with the sweet solution. A quantity of greenstuff—fairly succulent grass will do for all except cutworms—should be chopped up finely, dipped in the liquid, which must be kept stirred in the case of paris green, drained and distributed broadcast, but very thinly, over the soil, preferably in the late afternoon and evening, as most of the insects feed at night. To kill cutworms, it is necessary to use paris green and some greenstuff, such as potato tops, lettuce, rape, etc., more succulent than grass, but for red soil treatment, the cheaper and more convenient arsenite of soda and chopped grass is usually sufficient, cutworm injury being generally of little moment on this type of land. The arsenite of soda will poison surface beetles, snout beetles, crickets and grasshoppers.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The reader may note that no mention has been made of the effect of the bait on "wireworms." The grubs are not attracted by the bait, but the beetles have been poisoned by this means under favourable conditions. It has not yet, however, clearly been demonstrated that the beetles can be poisoned in large numbers under field conditions, and as the insects are not very important pests of maize, they may be ignored for the present, on account of the fact that an additional application of bait in April would be necessary for their destruction.

The time of distributing the poison is of extreme importance. If applied too early, a considerable proportion of the surface beetles, and perhaps of the snout beetles, will not have emerged from the pupæ in the soil. The ideal, therefore, is to bait the land as shortly as possible before the appearance of the crop above ground, but the weather must be taken into consideration. If heavy rain falls a few hours after the bait is distributed, the poison will be washed off and lost without any benefit being derived. As planting is usually carried out during a wet spell of weather, it is obviously hazardous to arrange to bait between this operation and the appearance of the crop. The farmer would appear, therefore, to be best advised to watch the weather, and distribute the bait at the end of November or the beginning of December during an interlude after the first heavy showers have fallen. On no account should the baiting be carried out before the rains, as its effect under such circumstances is likely to be very small indeed. It is possible, however, to obtain some prospective benefit by baiting after the crop is up, any time between December and the beginning of March. The treatment will not be effective against snout beetles, which at this time shelter within the maize plants, although a small percentage of these are likely to be poisoned, but a large proportion of the surface beetles which emerged at the commencement of the rains will be destroyed before they have started laying eggs destined to produce adults the next season. The next crop will benefit to a corresponding extent. The recommendation is therefore: Bait once or twice immediately before planting, and if the land is to continue in use, bait again during a dry spell between December and the beginning of March.

The method of application at present must be by hand; in fact, it is unlikely that any form of machine could be devised that could do the work cheaper. Twenty natives actually distributing, if kept well supplied with bait, should do from 30 to 40 acres an hour, or in four hours' work (from 3 to 7 p.m.) from 120 to 160 acres. Of course, farmers who are most competent in directing native labour will get the work done in the quickest and cheapest manner. A great deal depends upon the arrangements for a constant supply of bait. For serious work, a chaff cutter to cut the grass is indispensable; tubs will be needed to hold the liquid, and in most cases a water carrier will be required. If the work is properly arranged, however, the cost of treatment, including material, labour, etc., should not exceed 9d. to 1s. per acre.

It must be clearly understood that, although the use of this bait will reduce the numbers of certain pests very considerably, one application will not absolutely rid the land of their presence, and therefore although, other things being equal, the stand following should be a

great advance on that usually secured, the farmer must not expect anything approaching perfection in this respect. The treatment is chiefly recommended for lands which have held indifferent stands the previous season, and on such lands benefit of 20 per cent. and upwards has been secured by the use of the poison, that is to say, the treated portion has registered a stand of over 80 per cent., whilst the untreated remained in the region of 60 per cent. In addition, a much more even growth of the plants may be anticipated on treated land from the reduction of injury to the plants in the early period of their development.

It is also desirable to point out that poisoned bait is not a "panacea for all ills." It has no effect, for instance, upon the Maize Stalk Borer, the Maize Beetle (*Heteronychus mashunus*), or, as far as is known, the yellow grub, which eats into the heart of the plant underground, and has come to notice for the first time during the present season.

If properly applied, however, it tends to produce a considerable increase in the crop and a corresponding economy in farming operations. An investment of one shilling per acre in distributing the poison may well result in an increase of £1 per acre in increased yield and economy in labour. A proposition of this nature is certainly worth the attention of all maize growers.

EXPLANATION OF PLATE.

Eight species of insects common on red soil are represented, all of which may be killed with poisoned bait.

Fig. 1. Snout Beetle (*Systates* sp.).

Fig. 2. Snout Beetle (*Tanymecus* sp.).

Fig. 3. Surface Beetle (*Gonocephalum æquale*).

Fig. 4. Surface Beetle (*Emyon tristis*).

Fig. 5. Field Cricket.

Figs. 6 and 7. Grasshoppers.

Fig. 8. Cutworm.

Figs. 1 to 4 are enlarged about three diameters, the actual size of each insect being indicated by the adjacent hair line.

Figs. 5 to 8 are life sized.

Notes on Mining Law for Farmers.

By Advocate D. E. McCausland, M.A. LL.B.

In a highly mineralised country which also provides facilities for farming and ranching, it is natural that some difficulties should arise in reconciling the claims of the two industries. On the one hand, the existence of a prosperous mining population is of great importance to the country as a whole, and not least to the farmers, and consequently the fewer obstacles that we put in the way of the miner the better. On the other hand, a farmer who has settled down, made his home and laid out his cultivated lands cannot help feeling a very real sense of grievance if the discovery of a mine on his farm upsets all his arrangements, and possibly even interferes seriously with the development of his land. Rhodesia has not been free from difficulties and disputes of this kind. At one time they threatened to become acute. Fortunately the good sense of all parties came to the rescue, and a conference took place that eventually resulted in legislation (Ordinance 26 of 1914) embodying a compromise. For the benefit more especially of new settlers who may find it useful to learn the elements of the amended Mining Law as it affects their interests, the following summary has been prepared.

The acquisition of a farm from the British South Africa Company does not carry with it the right of mining for and disposing of the minerals on or beneath the surface. That right remains vested in the Company, who, in terms of the Mining Law, issue licences entitling the holder to prospect and search for minerals on any land, public or private (with certain unimportant exceptions), and to peg off claims. The prospector on his part must give notice to the occupier of his intention to prospect on a private farm, must, if required, exhibit his prospecting licence, and may not prospect on—

(a) any land within 500 yards of the principal homestead on any holding of land, whether such homestead be already occupied or actually in course of erection;

(b) any land within 100 yards of any other building or permanent improvement of a value of not less than £100;

(c) any land under cultivation;

(d) the area within 15 feet of any irrigation furrow, artificial water course, pipe line, well or borehole, or within 100 feet of a dam (Ordinance 26 of 1914, sections 1, 3 and 4).

Fences are not included under the heading of "permanent improvements." "Land under cultivation" is defined as "land which has been *bona fide* prepared for the growing of ordinary farm crops, or which has been allowed to lie fallow after the reaping of crops for a period not exceeding 18 months, and also land which has been *bona fide* prepared by ploughing or otherwise and upon which permanent crops, such as fruit or forest trees, paspalum, lucerne or other exotic grasses, have been planted and maintained." An owner who wishes to preserve fallow land from pegging must give notice to the Mining Commissioner.

Prospecting is not allowed on any plot of land not exceeding 200 acres in extent, the owner of which owns no other adjoining land.

The prospector has the right of grazing, free of charge, not more than 20 draught animals, which must be free from any contagious or infectious disease, but may not introduce any horned cattle or entire male herbivorous animals without the consent of the occupier. He may also take, free of charge, water for domestic use, and may take any indigenous wood he may require for domestic use or for the purposes of his location. He is also entitled, when he has posted his prospecting notice, to erect temporary buildings, machinery etc. He may not, however, exercise any of these rights on land not open to prospecting. The nature of his work necessitates the cutting of trenches and probably the sinking of shafts, but he is bound to protect all surface workings sufficiently to ensure the safety of persons and stock, and if he abandons the area, he must leave it in a permanently safe condition.

If the prospecting operations lead to the discovery of valuable minerals, the prospector may peg off a block of claims for each licence he may hold, the area of a block being approximately 20 acres for gold claims and 60 acres for base mineral claims, and he then acquires the right to introduce such horned cattle (excluding entire animals) as he may require for the proper working of his mine, but must pay to the landowner a grazing fee of 1s. a month for each animal for which he requires grazing. If he fails to herd and control his stock, he may be called upon to fence them off at the joint cost of himself and the landowner, but the fence becomes the property of the owner of the land.

In addition to the actual mining claims which may be pegged, a miner has the right to peg off areas for machinery sites, dam sites, depositing sites for tailings, etc., but pays a rental to the Government of 5s. per acre per month, and half the rent so received is paid by the Government to the landowner on whose farm the sites are situated.

When the claims are pegged off, the miner becomes entitled to the full use of all that part of the surface of the claims which he may require for mining purposes, but the landowner still retains the right to graze his stock upon or to cultivate the unused surface of the claims, and may even, by arrangement with the miner (or by arbitration if he is unable to come to an amicable arrangement), plant and reap annual crops on the unused surface of the claims.

The owner of claims has the right of taking wood for fuel or for other mining purposes from any land open to prospecting, and must therefore be allowed reasonable access to the wood. The right refers to indigenous timber only, and is controlled by regulations as to the manner in which the wood is to be cut and as to the payment to be made for it to the landowner. The tariff for wood is contained in Government Notice No. 72 of 1910, but is applicable only to wood cut on those farms granted under a title which gives the landowner the right to make a charge for mining fuel or timber. Land granted in the vicinity of mines is usually held under what is known as "Gold Belt Title," which gives the farmer the right to cut whatever wood he requires for his personal use, fencing, kraals, etc., but does not give him any right to sell it or to make any charge for it to the mines who may require to cut it. A *bona fide* farmer can, however, usually obtain from the Mining Commissioner of his district the reservation of the timber on a reasonable area for the protection of his own stock, etc., and the wood so reserved may not be cut by any mine.

The miner must also be allowed whatever water is necessary for mining purposes, without charge in the case of "Gold Belt Title," or if the supply is adequate for both the mine and the farm, but he must pay compensation to the landowner who owns his land under full title if the value of the land is diminished by the deprivation of water required for irrigation or similar purposes. The water actually required by the farmer for domestic purposes or for stock is always reserved to him.

The chief compensatory advantage of the "Gold Belt Title" is that if the landowner should lose his wood and water and has to put up with the occupation of part of his farm, he generally has the consolation of finding a new market for produce at his door. The relative advantages of the two forms of title cannot be nicely calculated, since so much depends upon the situation and possibilities of individual farms, but in practice it is believed that the restrictions in the "Gold Belt Title," which are very desirable in the interests of mining, have not caused serious inconvenience to the farmers who hold under it.

Contagious Abortion in Cattle in Rhodesia.

[Reproduced from the *Journal of Comparative Pathology and Therapeutics,* vol. xxviii., Part 2, June, 1915.]

By Ll. E. W. Bevan, M.R.C.V.S., Government Veterinary Bacteriologist, Southern Rhodesia.

From time to time during the past ten years cases of abortion in domestic stock have been reported to the Veterinary Department of Southern Rhodesia. One of the first outbreaks to be investigated was among a herd of dairy cows in Salisbury during the months of April and May, 1906, which, presenting features giving rise to the suspicion that it was of a contagious nature, was vigorously dealt with. "Enzootic abortion" was scheduled as a contagious disease under the "Animals Diseases Consolidation Ordinance, 1904," the premises of the owner of the cattle were placed in quarantine and the movements of his stock were restricted. These measures were apparently successful. Reports written at the time shew that every animal on the property was dressed three times with "Izal," sprayed on with a "Success" pump. The sheds and yards were disinfected throughout, and all cows received a vaginal irrigation with 1 in 2,500 corrosive sublimate solution. This strength caused very violent straining in cows heavy in calf, and weaker solutions were subsequently employed. These measures were apparently successful in suppressing the disease.

Since then isolated cases of abortion in cattle have been reported, and occasionally some half-dozen cases have occurred all about the same time on different farms. These have been attributed to different causes, the burning of the grass by veld fires being commonly held responsible. Just recently on one or two farms where abortions have occurred, in animals whose serums do not yield the agglutination reaction, suspicion has fallen upon a species of ergot on some of the pasture grasses. Owing to the exceptionally heavy wet season, many of the grasses are badly affected with fungoid diseases, but as to whether these possess ecbolic properties remains to be proved.

Abortion is also common among sheep, frequently as the result of driving pregnant ewes through the narrow gates of sheds and kraals, and perhaps also due to the practice of running goats with the flock, which injure the ewes by butting and fighting. Donkeys also, which

work in spans when heavy in foal, not infrequently abort. Some of the common local diseases, such as ephemeral fever, piroplasmosis and anaplasmosis, bring about the death of the fœtus and its subsequent expulsion.

Hitherto attempts were made to determine whether these outbreaks were of a specific contagious nature, but until the agglutination test could be applied definite evidence was not forthcoming.

In October, 1910, an article was published in the *Rhodesia Agricultural Journal*, and an official bulletin was issued for the information of farmers, embodying the findings of the departmental committee appointed by the Board of Agriculture and Fisheries to enquire into the disease. Directions were given to enable stock-owners to prepare smears of discharges from aborted cows, and material scraped from the placental tufts and from the stomach of the fœtus, for examination at the Veterinary Laboratory. Tubes were also supplied containing sterile cotton wool tampons mounted on wire, and particulars were given for the collection of exudate, discharge, afterbirth and contents of the stomach of the fœtus upon these plugs for cultural purposes. Unfortunately, although it now appears cases of abortion certainly occurred in numbers in certain districts, they were not reported, and the efforts of the Veterinary Department to determine the nature of those which came to their notice were not successful.

In 1913, when travelling through England with an agent employed by the British South Africa Company to purchase bulls for settlers, the writer was greatly impressed by the alarming prevalence of contagious abortion, and realised the danger of introducing the disease with animals imported for stud purposes. By the consent of Sir John M'Fadyean, he was permitted to study in the Research Laboratory of the Royal Veterinary College the technique of the agglutination test as applied to this disease, and to obtain cultures of the *B. abortus* and specific sera for the carrying out of the test on his return to Southern Rhodesia.

In March, 1914, when visiting British East Africa, he obtained from Mr. Eustace Montgomery, Veterinary Pathologist, cultures of the bacillus used by him in the application of the test in the Protectorate, and shortly after cultures were obtained from Sir Arnold Theiler's Laboratory, Onderstepoort, of what is known as the "South African strain."

About that time information was given that a herd of cattle from the district of Fort Jameson, and then in quarantine on the Zambesi, were suffering from contagious abortion, and, on the arrival of these animals at the quarantine station at Sipolilo, Southern Rhodesia, blood was taken from certain suspicious cases and was tested at the Veterinary Laboratory, Salisbury, with the result that it was found that four animals gave a marked re-action to the agglutination test. The matter being of such urgent importance—there being several hundred head of cattle in the mob, which it was the intention of the owner to dispose of in Southern Rhodesia—the greatest care was

exercised in the test, which was conducted separately with each of the three strains of culture above referred to, and it is of considerable interest to note that the re-actions with each strain corresponded exactly, indicating a very close co-relation between the disease occurring in Great Britain, British East Africa, the Union, and Northern and Southern Rhodesia. Samples of the same blood were sent to Sir John M'Fadyean, at the Royal Veterinary College, London, who was able to confirm the diagnosis.

Almost at the same time cases of abortion occurred among cattle on the farm Gatsi, Marandellas district, and on the application of the test these were found to be due to the *B. abortus*. Recent investigations into this outbreak suggest that the disease originated some five years ago from an imported Devon bull, which was sold to a farmer in the Marandellas district, with the result that the disease became so prevalent in his herd that he was eventually compelled to sell his stock and farm.

It has been suggested that in this country the disease assumes a mild form, but that this is not always the case is shewn by the disastrous results attending the purchase of the Devon bull previously referred to. It is not surprising that in the herd from the north the disease does not at present assume serious proportions, inasmuch as the owner admits that it has existed several years in his herd; and the fact that the cattle have been travelled almost continually some six hundred miles would be in favour of its reduction by escaping from the infected grazing.

The principal source of infection being the ingestion by the pregnant female of food or water contaminated by the discharges from an aborted animal, it is probable that the chances of infection are less in a country where cattle graze over a large area and are not crowded together in such a way as to lead to a concentration of infection. Against this, of course, is the custom of "kraaling" cattle at night, but as a rule when in the kraal animals are not feeding. Another danger is the drying up of water supplies during the dry season, which often lasts for six to eight months, so that not infrequently cattle eventually have to depend upon muddy pools or dams, which may become highly polluted with excreta and possibly infected with discharges from aborted animals. The experiments of the departmental committee lead to the opinion that "virulent material, if kept fluid and free from putrefaction, remains infective for several months, but not for a year," and also that "desiccation has a destructive influence on the vitality of the virus." It is probable, therefore, that under the climatic conditions of this country infective material when exposed on the surface of the soil will become seriously attenuated, if not actually destroyed by the sunshine and desiccation during the dry season, and that virulent material deposited in damp places will be destroyed by putrefaction, the onset of which is exceptionally rapid.

It was held by the committee to be "highly improbable that abortion bacilli remain for a long time active in the bodies of non-pregnant animals." Stockman states "with regard to the cow . . . there is a

certain amount of evidence to shew that a large number of animals have got rid of the infected material from the genital organs from two to three months after the act of abortion." This fact is of practical importance in this country, where, at any rate among native herds, there is a well-marked "calving period," so that outbreaks of abortion occur at certain times; and, since females which have aborted tend to lose the infection if they remain barren for a few months, it is possible that a considerable number of infected animals will have become "clean" before the period of service again arrives. Against this must be remembered the additional danger of the bull as a factor in transmission during a limited but strenuous service period.

In the report of the committee it mentions that "cows which have aborted very often return to the bull two or three times, unless a long interval has elapsed since abortion took place. It is believed by many farmers that each failure to hold the bull really means that the cow has aborted a very young fœtus. This opinion is based merely on surmise, and no evidence in support of it has been obtained by carefully watching the animals which aborted at the laboratory and were afterwards put to the bull."

In this connection it is interesting to note that the first test of the cattle from Northern Rhodesia implicated four cows known as "queens," which is the term locally applied to indicate barren animals which, in spite of the frequent attentions of the bull, fail to become pregnant. This test was carried out on the 10th September, 1914, and the bulls were then taken out of the herd. The blood of these same animals was again tested on the 16th March, 1915, six months after the removal of the bulls, and again shewed a very high agglutination. From the experiments of M'Fadyean, Sheather and Minett, it appears that animals artificially infected with living cultures yield an agglutination re-action generally at its highest some fourteen days after infection, and in most cases dying out within three months, which suggests that these "queen" cows have been recently stimulated to the production of agglutinins, and it is possible that the stimulus may have been afforded by the retention of fœtal membranes or other infected material within the uterus. The danger, therefore, presents itself that if, on the re-introduction of the bull, any of these cows should again become pregnant and abort, she might once more establish a source of infection, and it would appear wise to counsel their destruction.

It is a matter for congratulation that the disease was detected before it became more widely disseminated. The owner of the herd from Northern Rhodesia, having purchased a farm not far distant from Sipolilo station, was allowed to remove his cattle there, where they were placed under quarantine. Other farms where the disease was proved to exist were also declared "infected areas" and placed in quarantine. The owner of the herds was advised to remove his bulls and to allow females to remain barren for six months. The bulls having been removed during the months when service usually takes place, it was probable that many of the cows would refuse the bulls until the next service season. In the meantime the pregnant females are being tested, and the re-actors put aside under strict isolation.

The collection of the serum is a matter of some difficulty. The operator himself may have to superintend the throwing or securing of the animal before collecting the blood. It is thus difficult to observe strict asepsis, which is rendered all the more so by the clouds of dust in the dry season, or muddy state of affairs during the rains. The bloods, once collected, have to travel long distances, often by native messengers, and are frequently putrid on arrival at the laboratory, and, if not decomposed, have undergone hæmolysis, which interferes with the re-action. However, re-acting sera have given very definite results; none have failed to agglutinate in 1 in 100 dilution in 24 hours, and in most cases the 1 in 200 dilution has been water-clear in a few hours.

The principle of systematic dipping being widely practised throughout the country, it was necessary to ascertain whether immersion in solutions of arsenic would destroy the abortion bacillus, for it was thought that, if it did so, the regular dipping of stock would tend to cleanse them, but if not, then infected animals would contaminate the dipping fluids, which might infect pregnant animals subsequently passing through the "tank." Test experiments indicated that even weak solutions of Cooper's Improved Dip—1 in 300 solution—produced a harmful effect on *B. abortus* in as short a time as one minute, and it was concluded that, should infected animals passing through a dipping tank discharge infected material, other animals following would not become infected. The regular dipping of cattle in arsenical dips in strengths for five-day or weekly dipping was therefore recommended.

The question of the vaccination next had to be considered. The experiments reported by Stockman to the Tenth International Veterinary Congress shewed very satisfactory results following the injection of massive doses of an anti-abortion vaccine "A," consisting of living bacilli. In four groups the results were briefly:—

Animals inoculated with living bacilli ("A").

Groups	1	2 Previously aborted.	2 Heifers.	3	4
Number treated	201	31	65	292	493
Aborted, %	4.9	6.4	6.1	7.5	6.5
Calved correctly, % ...	95.1	93.6	93.9	92.5	—

As against *Control.*

Groups	1	2 Cows.	2 Heifers.	3	4
Number	243	6	47	189	265
Aborted, %	20.1	66.6	14.8	27.5	38.0
Calved, %	79.9	33.4	85.2	72.5	—

Less favourable results were recorded from inoculation with large doses of bacilli killed by exposure to a temperature of 65° C. for half an hour, called anti-abortion vaccine "B." Evidence was obtained at an early period that very little benefit could be expected from it for the trouble involved, and it was discontinued.

Animals immunised with dead bacilli ("B").

Groups	1	2 Previously aborted.	3
Number treated	76	11	34
Aborted, %	21.0	54.5	20.0
Calved, %	79.0	45.5	80.0

These figures shew very little improvement over the control groups. Nevertheless Buxton has recently published in the *Veterinary Journal*, "Some further Experiments in the Prevention of Bovine Epizootic Abortion," from which he concludes that "there are reasonable grounds for assuming that it is possible to produce in susceptible animals a sufficiently high degree of immunity against *B. abortus* by means of suitable doses of vaccine composed of killed organisms," but admits the figures at present available are not sufficiently numerous to permit of a definite assertion being made. In view, however, of the many advantages which this method of protection possesses over that entailing the use of living organisms in which the element of risk of infection from the vaccine has to be taken into consideration, further work in this direction is of the utmost importance.

In a country such as Rhodesia, where methods of transport are often primitive, and where the operation of inoculation has to be performed in a rough and ready manner, these risks are considerable, and a dead vaccine would be far preferable, if equally good results could be obtained. Buxton's method was to inoculate five times at intervals of one week, increasing from a primary dose of ten thousand million organisms in 10 c.c. to a final dose of five hundred thousand million organisms in 25 c.c. of saline. In dealing with outbreaks in this country, these visits at frequent short intervals to farms at long distances from the laboratory would involve considerable inconvenience. Tests were, therefore, made to determine the re-actions due to inoculation with such doses of dead vaccine, prepared from the three strains of culture. Some difficulty was experienced in counting the organisms by reason of their tending to cluster, but, after a number of attempts yielding results within a certain limit, the average was accepted.

No. 1.—Imported yearling Shorthorn heifer, inoculated with ten thousand million dead organisms (*B. abortus* mixed strains), yielded slight (if any) re-action.

No. 2.—Imported roan Shorthorn yearling heifer, inoculated with ten thousand million dead organisms (*B. abortus* mixed strains), yielded maximum re-action—agglutination appreciable 1 in 50—on thirteenth day, lasting until twenty-sixth day, and having disappeared on thirty-fourth day.

No. 3.—Imported red Shorthorn yearling heifer, inoculated with twenty thousand million dead organisms (*B. abortus* mixed strains), yielded no re-action on eleventh day, agglutination 1 in 200 on fourteenth day, lasting until twenty-seventh day, having disappeared on thirty-sixth day, with traces again on forty-sixth day.

No. 4.—A black heifer calf, inoculated with fifty thousand million dead organisms (*B. abortus* mixed strains), yielded a marked re-action 1 in 200 on the sixth day, and lasting at that strength until the twentieth day, declining to 1 in 150 on twenty-seventh day, remaining at that level until thirty-sixth day, but dying out by the forty-eighth day.

From the foregoing experiments it would appear that even small quantities of dead organisms will produce specific agglutinins, but that the degree of agglutination re-action is in proportion to the number of organisms.

A single experiment was then conducted to compare the re-actions to equal numbers of dead and living organisms. As stated above, No. 4 heifer received fifty thousand million dead organisms, and with her re-action may be compared that of—

No. 5.—A half-bred Sussex-Angoni bull calf, which received fifty thousand million living organisms (*B. abortus* mixed strains). (*Note.*—20 c.c. of emulsion was divided into two equal parts. One 10 c.c. was heated and injected into No. 4; the other 10 c.c., unheated, was injected into No. 5.) On the sixth day the serum of No. 5 caused a deposit of 1 in 200, and a similar re-action on the thirteenth day, 1 in 100 on the twenty-first day, 1 in 75 on the twenty-seventh day, while traces 1 in 50 were still present on the forty-seventh day.

This re-action corresponds almost exactly with that produced in No. 4 with equal quantities of dead organisms.

To observe the effect of repeated injections, No. 2 was given ten thousand million dead organisms, and re-acted as previously stated; on the thirty-first day she was given forty thousand million dead organisms, yielded no re-action on the thirty-fifth day, but an appreciable deposit 1 in 200 on the thirty-ninth day, 1 in 150 on the fortieth day, 1 in 100 on the forty-fifth day, 1 in 100 from the forty-ninth to the fifty-fourth day, but none on the seventy-sixth day, when she again received forty thousand million living organisms. Six days after no agglutinins were present, but on the thirteenth day the serum agglutinated 1 in 100, on the sixteenth day 1 in 200, on the twenty-first day 1 in 300, on the twenty-eighth day 1 in 350, on the thirty-fifth day 1 in 250, on the forty-seventh day 1 in 250, while at the time of writing, the fifty-fifth day, this re-action shews no reduction.

These experiments are too few to justify any conclusion as to the relative value of the two methods, but indicate that well-marked re-actions may be obtained with dead bacilli, varying with the number of organisms used. Unfortunately further work on these lines cannot be carried out here, but might with advantage be followed up in other laboratories where greater facilities and suitable animals are available.

A further article on this subject, for general information, is in course of preparation.

Tobacco.

FORECAST OF 1918-19 CROP.

By H. W. Taylor, B.Agr., Tobacco and Cotton Expert.

The present position of the tobacco industry should be gratifying to growers and others interested in this important crop. Satisfactory prices are practically assured for well-cured leaf of good quality. Generally the crop is making satisfactory progress, and the quality of the leaf as grown is good. The acreage planted to both Virginia and Turkish varieties shews an increase as compared with the previous crop. In fact, the total yield is expected to be the largest since 1912-13.

The weather conditions for transplanting were generally favourable, excepting in parts of Mazoe district, and the resulting stand is, on the whole, good. In some sections excessive rainfall was experienced, which did considerable damage, but in most of the tobacco-producing areas the weather has been favourable for the growth of the plant.

Many growers lost part or all of their early seed beds during the epidemic, so that a rather large percentage of the crop was transplanted late. The yield from this portion of the crop is yet problematical.

Curing is now in progress, and the writer wishes to warn growers against the erroneous practice of curing out their leaf too green in colour. Cured leaf with a slight greenish colour will improve after curing, but leaf which shews principally green will not change colour in the bale, and there is practically no demand for leaf of this colour. Growers are, therefore, warned of the danger in curing out their leaf before the yellow colour appears. Contrary to the prevailing opinion, leaf which cures out green cannot be treated to advantage in the warehouse, and growers cannot expect satisfactory prices for this class of leaf.

The present forecast is of course approximate, both as regards acreage and yield. The approximate area planted to Virginia varieties is 3,665 acres, and the estimated yield is placed at 1,282,750 pounds of cured leaf. The approximate area planted to Turkish varieties is 1,130 acres, and the anticipated yield 282,500 pounds of cured leaf. The following table shews the approximate acreage for each district, and also the acreage for the same districts last year.

FORECAST: TOBACCO CROP, 1918-19.

District.	Acres. 1918-19.			1917-18.			1918-19.
	Virginia.	Turkish.	Total.	Virginia.	Turkish.	Total.	Increase or decrease.
Marandellas	1,280	90	1,370	1,421	56	1,477	− 107
Salisbury	860	200	1,060	355	152	507	+ 553
Mazoe	685	150	835	116	33	149	+ 686
Hartley	290	—	290	70	6	76	+ 214
Makoni	250	50	300	140	43	183	+ 117
Mrewa	250	50	300	257	140	397	− 97
Lomagundi	50	200	250	46	54	100	+ 150
Bulawayo	—	390	390	—	225	225	+ 165
	3,665	1,130	4,795	2,405	709	3,114	+ 1,681

Estimated average yield per acre:—

Virginia - 350 lbs.

Turkish - 250 ,,

Analysis of Dipping Fluid.

Owing to the frequent receipt of samples of dipping fluid without any indication of the source of origin, or with only inadequate or indefinite means of identification, notice is given that no samples will be analysed unless the following particulars are clearly stated on a label securely attached to the bottle:—

(1) Name of sender.
(2) Postal address.
(3) Brand of dip used.
(4) Date taken.

The Turkey.

By Arthur Little, Poultry Expert.

It is well known that the turkey came from North America—not, as some suppose, from Turkey—and is the lineal descendant of the northern wild turkey. The first attempt at domestication was made by the Indians. The origin of the name is doubtful. Some have suggested that it came from the resemblance of the red carunculations to the old Turkish costume of a red fez coming down to the ears, with a dark flowing robe beneath; others, that the word is corrupted from "turquoise," as applied to the bluish carunculation about the head; others, again, from the fact that the designation "A Turk," being applied to anyone of a domineering and pompous disposition or appearance, could similarly be applied to the turkey tom.

There are seven varieties—the bronze, Narraganset, buff, white, black, slate and Bourbon red, but it is only necessary to deal with the first-mentioned, for this is *par excellence* the utility and market turkey. The others are bred more for exhibition purposes.

Rhodesia most suitable for Turkeys.—There is no doubt that Rhodesia is peculiarly adapted for turkey raising. We have many months of dry warm weather, generally a light and often a sandy soil, and abundance of natural food, and above all—which is most necessary for the successful rearing of turkeys—sweet fresh virgin soil and plenty of shade. The farm is the natural home of the turkey, and one that has bush on it—as all in Rhodesia have—is all the better; it forms a natural breeding spot, and furnishes food that is particularly palatable to their taste.

Mating Turkeys.—Eight to twelve hens can be given to one tom, and, if on good free range, as many as eighteen to twenty. One clutch of eggs is fertilised at one time, and among the peasants of Holland, Belgium and Northern France the turkey tom is taken round in the same way as a stallion is. The breeding stock should be well matured, strong, vigorous and healthy. Never breed from a hen under one year old. Eighteen-month and two-year-old hens are better, if the tom is not more than one year, and *vice versa*. Yearling hens will lay more eggs than an older hen, but the two-year-old hens' eggs will hatch stronger poults. As a rule turkeys are not profitable after they are four years old, while three to four-year-old toms usually become cross and irritable, and are dangerous to have about where there are children.

In mating, remember that the hen gives the type and size to the progeny, the tom bone, colour, strength and vigour, and as the main points required are size and a long breastbone, the largest hens possible should be used. This point should be well noted by turkey breeders of Rhodesia, for almost invariably one sees large toms and small hens, whereas the females should be tall, rangy birds, with long deep bodies, broad backs and full rounded breasts, with as big bones, feet and legs as possible. The tom should be medium in size and have good vigour.

Management of the Laying Birds.—Once having mated the birds, one must be sure of getting the eggs. It is better for all turkeys, both breeding stock and young ones, to have free range, but turkeys, as all know, are very prone to hide their nests. There are two alternatives open to the turkey breeder: (1) To locate the nests and carefully build over them a shelter, to prevent vermin reaching the turkey and her eggs, and placing in front of her food (mealies, etc.), water and grit; or (2) putting the breeding birds in a large pen with barrels or comfortable receptacles for nests, and confining them in this each morning till all the hens have started to lay, and allowing them out each afternoon. In this pen can be put their roosting house—large, roomy and made of thatch, with an open front—to which they will return each evening.

Fresh, Sweet Ground and Free Range.—If too closely confined, turkeys will not thrive, and the freer the range the more eggs they will lay, and the stronger, more vigorous and healthy they are; furthermore, if run with fowls or ducks, it is well nigh hopeless to try to rear the young ones or keep the adults in good healthy condition. This is one of the chief causes of the failure of so many people who attempt to keep turkeys. They cannot stand hard, beaten-down, tainted ground; they are too closely allied to their wild ancestors. A large cattle pasture and timbered lands where there is not much undergrowth are ideal places for the running of turkeys, and Rhodesia is chiefly composed of such; therefore, there is no doubt at all that this country is ideal for turkeys. They most certainly do not do well in small crowded quarters. They *can* be reared to some extent on a small range, but such specimens are usually stunted in size, and lack health, strength and vigour. When the turkey was first found, it ran wild in the woods; hence the love of range is its first instinct, and it will attain nearer perfection when it has freedom. It will furthermore get practically all its food, in the form of grass, insects and weed seeds. After they are over the chicken stage, they require no food until within a few weeks of marketing time, and herded in this way, in flocks of 100 or 200, by a boy, what live stock is more profitable?

Hatching Turkeys.—The best method is to allow the turkey hen to choose her own nest in a secluded spot. See that she has plenty of food and water within reach, and disturb her as little as possible; but, in view of the many natural enemies she has in this country—*e.g.*, snakes, wild cats, etc.—the procedure should be as given above.

Do not disturb the hen for at least twenty-four hours after the eggs are due to hatch; she will stay on this period of time to allow the chicks to gain strength. Always take a piece of stale bread

moistened with milk and put it near the nest, near enough for her to reach it. This is very important, for, if she is hungry, she may leave the nest and drag the chicks after her before she should.

Put mother and chicks in a good roomy coop, with plenty of grass on the floor, and wooden slats in front, in and out of which the young turkeys can run at will. Place this in a shady spot where the grass is short and the ground untainted and fresh; move regularly every day, 15 yards from the place on which it stood the previous day. Continue this for 10 days or a fortnight, by which time the chicks will be strong enough to follow the hen, then let her out all day and every day, except during the wet weather or when there is a heavy dew. Wet weather and damp ground always chill young turkeys, set them back and often prove fatal. As soon as hatched, dust the hen and chicks well with some insect powder. Do not give any food for 24 to 36 hours; then give grit and charcoal. *Both are most necessary* at *all* times of a turkey's existence.

Many young turkeys are killed by over-feeding. Always keep them a little hungry. Turkeys over-fed at an early age frequently droop, and often die at about three weeks old; especially is this so in hot weather. While the turkey hen is in the coop, feed on stale but not sour bread, moistened with a little sweet or thick separated milk, chopped onion tops, munga and crushed mealies; also put a dish of separated thick milk where they can always have access to it. When the hen turkey is let out, give her and her chicks plenty of range, and feed the above ration morning and evening till they can fend for themselves, when a feed of crushed mealies in the evening is sufficient. They can pick up the rest of their food on range, and do best on insects, weed seeds, grass, etc.—in fact, such food will keep them in better condition than any that is fed to them.

Insects and Diseases.—Should the young chicks droop and do not pick up, the very first thing to look for is lice. These are fatal, and are answerable for more weak and weedy birds and deaths than anything else. Use a good insect powder freely, but do not allow it to get into the eyes. If ticks are noticed on adults or chicks (they are found on the head and neck only), pick them off and smear the head and neck with fat of some sort. In looking for lice, examine the bases of the quills on the wings and round the vent. Keep the adults and chicks free from insects, and almost all danger of loss is overcome.

Indigestion or white diarrhœa is generally caused by over-feeding, irregular feeding, allowing the chicks on damp ground or wet grass and dirty drinking water. Under no consideration breed from a diseased turkey, especially one that is suffering or has suffered from roup, swollen eyes or similar diseases. It is much safer to kill a sick turkey than to allow it among a flock of healthy birds.

Summary of Successful Turkey Breeding.

(1) Breed only from vigorous, well-matured stock.
(2) Keep stock in healthy condition.
(3) Do not let young chicks run on wet grass.

(4) Do not over-feed or starve young chicks.

(5) Make war on the lice and ticks.

(6) Do not run with fowls or ducks.

(7) Give plenty of range and *always* fresh sweet ground, with as much shade in hot weather as possible.

Rhodesia is pre-eminently suited for turkey keeping. Generally the climate and soil are excellent, natural food abundant, and range unlimited. There is no reason why, if the above advice is followed, we should not have in course of time large flocks of turkeys, herded by boys, running over many of the farms in this country, and turkey ranching become as common as, and infinitely more profitable, value for value, than cattle ranching.

Maize Grading.

By C. Mainwaring, Assistant Agriculturist.

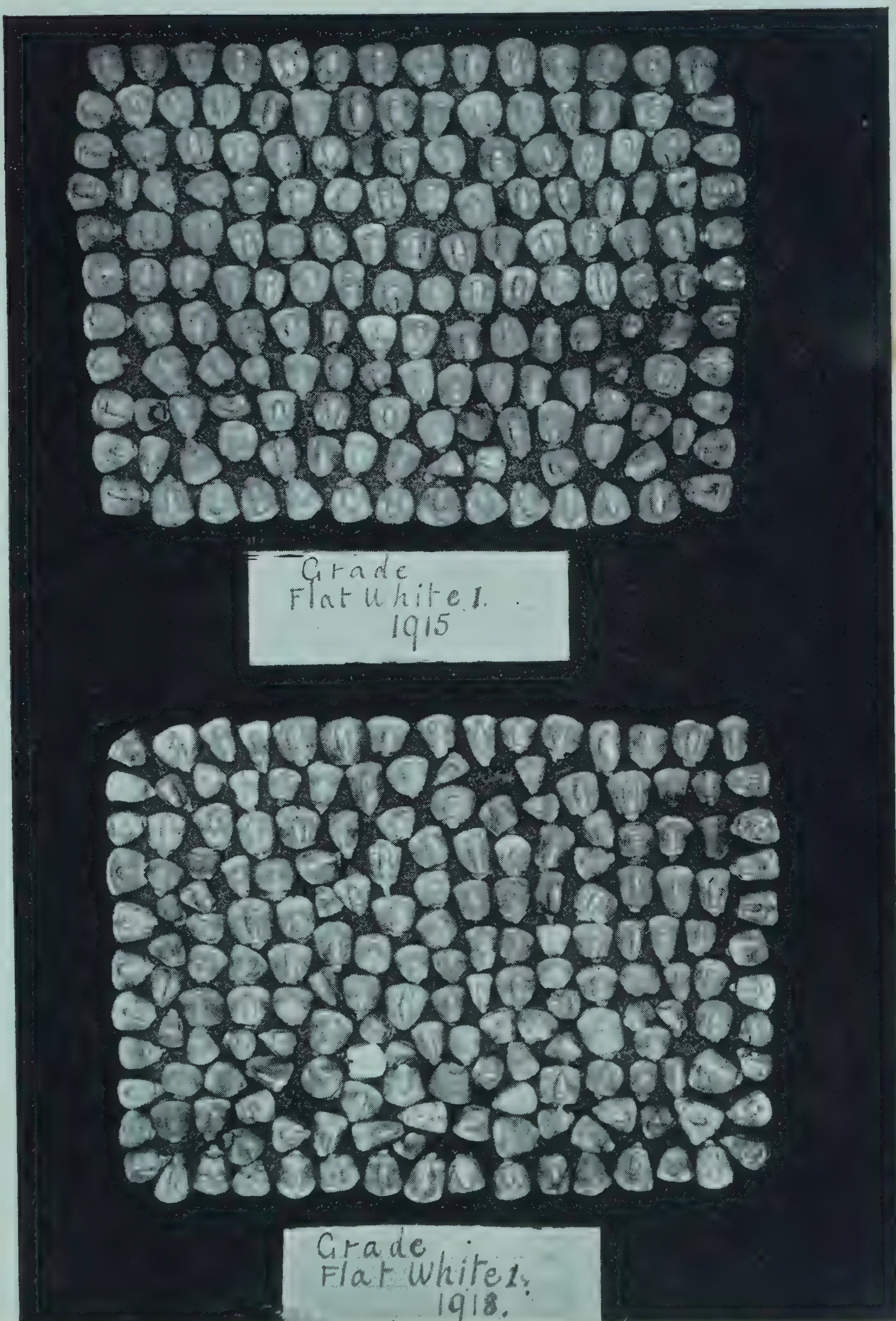
These notes are intended to give brief directions and practical suggestions that will be helpful in preparing and grading maize for export.

We all recognise maize as the chief crop of Southern Rhodesia; therefore it has received special attention, and to-day we pride ourselves upon the quality of grain produced. It is only fair to give credit to our progressive and enterprising maize growers, who by careful and true selection have produced such good results. A favourable impression has been created in Europe, and a definite demand has arisen for the best qualities of Rhodesian maize, but if we wish to keep the markets which have been opened to us, we must see that we supply only the class and quality of grain these markets demand; hence the necessity of grading. We have to look upon the grader as our protector against getting a bad name in Europe. The points for consideration in grading maize for export are explained below:—

"Condition of grain" refers to soundness, plumpness, sweetness, cleanness and brightness.

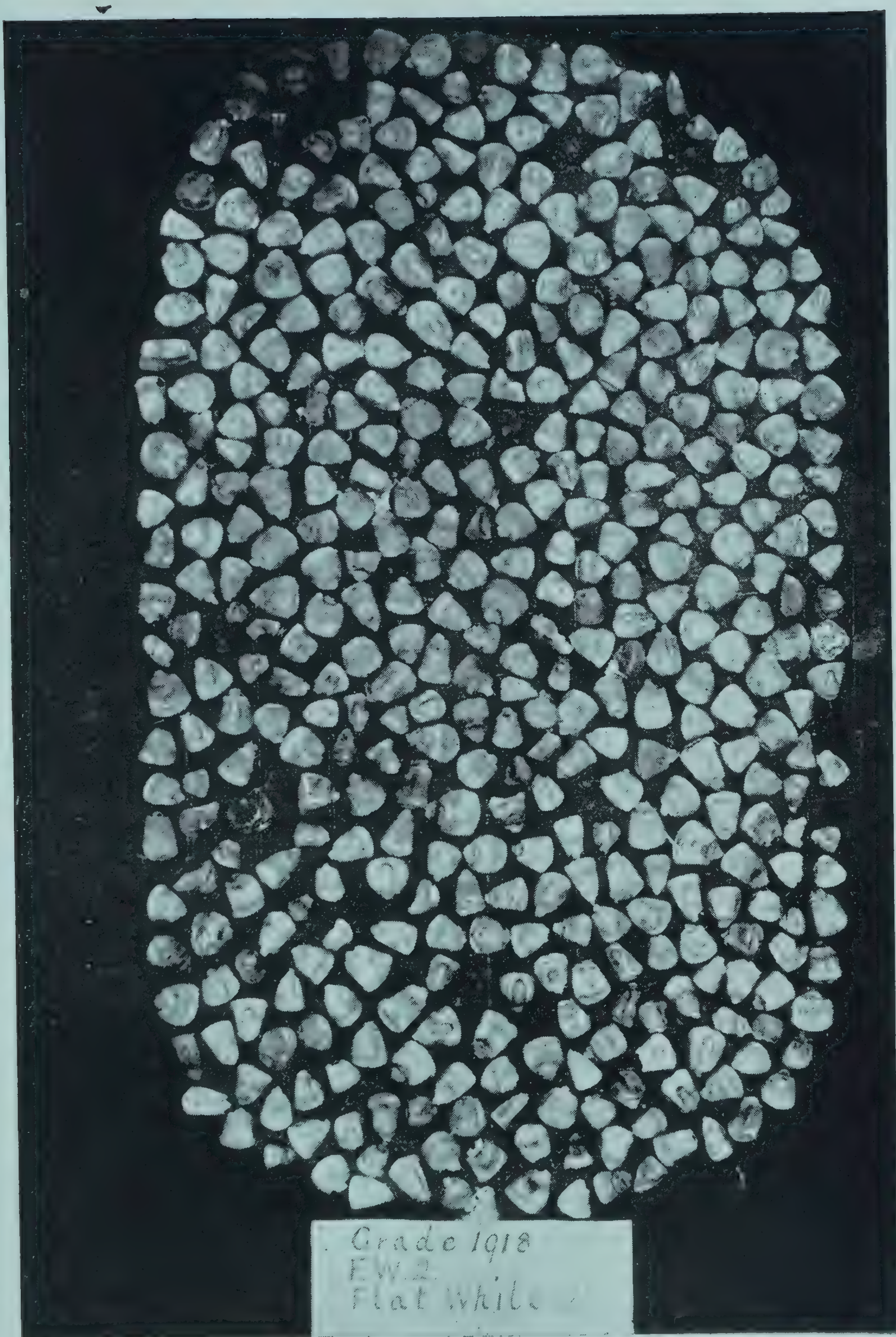
Soundness.—Sound grain, free from decay or the ravages of insects (weevils, etc.).

Plumpness.—Plump grain is neither shrivelled nor chaffy.

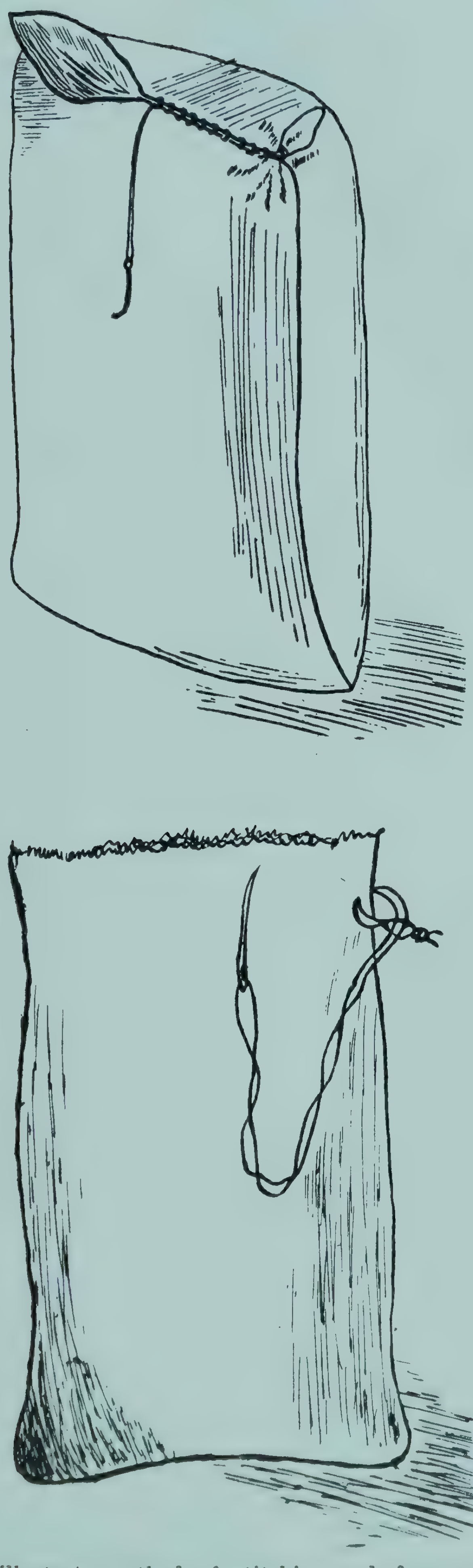


To illustrate difference between first grade of good year (1915) and first grade of poor year (1918).


Grade 1913
F.W.1
Flat White 1


Grade 1918
E.W.2
Flat White


Grade 1918
F.W.3
Flat Whites



To illustrate method of stitching sack for export.

Sweetness.—Sweet grain is free from mustiness or objectionable smell.

Dryness.—Dry grain should not contain more than 10 to 12 per cent. of moisture, to enable it to travel safely from the port of Beira to Europe.

Cleanness.—This refers to freedom from bits of cob, chaff and all extraneous matter.

Brightness.—A first-grade parcel of maize should be bright and showy. Grain which has been harvested too early and then dried out loses its brightness, and a dull sample is the result.

Soundness and plumpness are considered the primary points in studying condition for export. Sweetness comes third, dryness fourth, for a sweet sample, but not quite dry, may be dried out, but a dry sample that is musty will never get sweet again.

Flat White 1.—To be in prime condition, should be thoroughly sound, plump, dry, sweet, clean, and grain of a uniform size.

Flat White 2.—To be dry, sweet, reasonably clean, but not sufficiently sound or plump for No. 1.

Flat White 3.—If only reasonably clean, dry, but not sufficiently sound for No. 2.

The Value of Fencing on Ranches.

By "Z."

In presenting this article, I wish it to be understood that I do not profess to pose as an authority on cattle, but some of my remarks based on actual experience and observations in pursuing cattle ranching in Rhodesia may be helpful to some fellow-farmer or beginner, and, as the *Agricultural Journal* usually invites interchange of ideas relating to the farming industry, I beg to offer the following observations:—

The value of paddocks cannot be over-estimated, and those farmers who can boast a paddock or two fully realise the value of them, and the time will certainly come when the farmer who persists in the old method of kraaling cattle will find he cannot keep pace with the paddock rancher. The benefits derived from paddocks are too numerous to mention, and the outlay to the farmer erecting paddocks for cattle to graze night and day is fully compensated by the condition, low death rate, healthy stock, etc. Just compare a mob of paddock cattle, at any

time of the year, with those shut up in kraals at night. The comparison is so marked that there is no disputing the point, and, after all, the custom of kraaling stock (often in muddy kraals) is a very primitive method, to say the least, and only the hardy Mashona could survive such treatment.

Paddocks should be small, as cattle are inclined to roam about in large paddocks, instead of grazing leisurely, and this roaming aimlessly, often in lines, one following the other, from one end of a paddock to the other, usually results in deep tracks being made through the pasturage, and eventually dongas and soil erosion ensue. It would therefore follow that the pasturage in small paddocks, owing to the manure being more evenly distributed, and the grass likewise eaten off, will improve more quickly than in larger ones.

Wild animals in certain parts of Rhodesia are certainly a source of danger to paddock cattle, but even should a few animals be killed now and again, no serious notice need be taken, as the advantages gained are overwhelming, and systematic poisoning of vermin in and around the paddocks would make the stock fairly safe, and it is only a matter of time when these pests will gradually disappear. Buck and wild ostriches too will damage fencing, but this usually lasts only a season until they become used to it, when they either jump the fence or keep away from it; hence it is usual to erect what one might call an elastic fence in such areas—that is, have your standards 20 yards apart, and the usual four or five droppers in between. This gives better resistance than the more solid fence.

A mistaken idea which most people have, with a view to cheapness, is to have a wooden pole fence. It is usually said, "I have all the poles I want on my farm just for the cutting and carting," but if a little calculation were made—taking the cost of labour in cutting and barking poles, digging holes, tar and staples, which cost recurs in about eight years' time, when poles are destroyed by white ants, rotting, etc.—it will be found that the iron standard would have been cheaper at the beginning, and you will have money saved as time goes on.

Now, in making a paddock, it should be placed and arranged conveniently for the addition of future paddocks, with particular regard to the position of water and dipping tanks. A paddock should be so arranged as to have a dip at a suitable corner, and as other paddocks are added, let them all join up at the dip, which should be enclosed in an area of about 50 acres, to facilitate dipping. In this way, one dip would serve four paddocks. The same applies to water for stock, troughs leading into the different paddocks, served by a pump or windmill. It must be borne in mind that drinking water for stock in paddocks should be at points not further than three miles apart.

In conclusion, I wish to mention that an insufficient number of bulls is usually run with stock in paddocks. To secure the best results and full percentage of calves, you would require one bull for every 20 to 25 cows. This would give a cow a chance to get to a bull when she comes in season. As the period usually lasts only a few days, she may be away from a bull during that time, which is often the case in large paddocks.

The Construction of Dipping Tanks for Cattle.

REVISED APRIL, 1919.

The general recognition of the great value of dipping cattle, both as a preventive of disease and for the maintenance of condition, has led to frequent demands for guidance in the erection and use of tanks. Much attention here and in other countries has been given to this subject, and plans and specifications are now approaching that uniformity which indicates practical finality, and differences of design are mainly in detail and not in principle. *Whilst the accompanying drawings may be taken, therefore, as generally applicable, they are meant to serve only as an indication of dimensions, specifications and accessory requisites of a serviceable and economical dipping tank, and are subject to modification to suit individual ideas and circumstances.* The plans are intended to serve as a model of general applicability, and are not to be slavishly followed in every instance. Throughout the specification and description, trade technicalities have as far as possible been avoided, and such simplicity aimed at that a farmer or handy man may build a tank without recourse to the services of a skilled builder or contractor.

Select a site as near as possible to permanent water, on firm and solid ground; avoid swampy ground or great difficulties may be experienced. If the site is level, fill up the space to be occupied by drip yards with excavated material until sufficient rise is obtained to secure efficient drainage.

Excavate the pit to the size and shape shewn on drawings. To do this carefully mark off the centre line and other dimensions of the tank with wood or iron pegs. Cut down the sides to a straight face, and be careful not to excavate more material than is shewn, otherwise it will necessitate the space excavated being filled with concrete at an additional and unnecessary cost. Cart away or level round the site the excavated material not required for filling in. Provide a mixing board of planks or boards, bedding firmly on sand—10 ft. by 10 ft. is a convenient size—and fasten same together by driving in pegs on the outside. Cover with sand, and with a broom or shovel work the sand into all the joints until the platform becomes firm and solid.

Provide sufficient pine timber for constructing the framework, which should be carefully done. A little extra time occupied in this will be saved many times over at a later stage, whereas a carelessly

or badly constructed frame will occasion much difficulty in keeping the walls straight and true to batter, and add considerably to the cost in finishing. Pine timber 3 in. by 2 in. is suitable for struts, braces and uprights, and if placed at suitable distances the lining boards need not be more than $1\frac{1}{2}$ in. thick, and of any convenient width.

The strength of concrete varies considerably, according to the quantity and the quality of the cementitious material used, also according to the nature of the aggregate employed. A coarse, clean sand and broken metal with sharp edges and irregular surfaces gives a material of greater strength than that produced by fine sand and rounded water-worn pebbles, because a better surface is offered for the interlocking of the crystal formation. Stone ballast for the concrete should consist of the best clean granite or quartz, broken in angular pieces, no stone to be larger than will pass through a $1\frac{1}{2}$ in. ring (any way). The stone ballast used must be thoroughly clean, or if not must be well washed before mixing. Water must be clean and free from organic impurities. From 21 to 24 gallons of water are required for every cubic yard of dry material. The sand should consist of the best clean, sharp, granite grit, free from clay, loam or vegetable matter, and if necessary, thoroughly well washed before using. The quality and proportion of the sand used are important factors in producing good work. It should not be too fine in grain, or the particles to be united together become too numerous for the quantity of cementitious material employed; it should be free from muddy or clayey particles, as these deleteriously affect the formation of crystalline silicates of lime and alumina, without which the proper setting or hardening of Portland cement cannot take place. For the best results the mortar consisting of cement and sand should be in just sufficient quantity to fill up the interstices of the stone ballast and produce a compact mass when the whole is bound together. Before commencing to lay concrete the bottom of all excavations must be damped and well rammed. Well ram all round the walls of the tank as the work proceeds. The whole of the materials should be accurately measured in boxes or empty cement casks. The concrete should be composed of five parts broken stone, three parts good sharp sand, and one of cement, to be turned over twice in a dry state and twice in a wet state, and when laid in place to be thoroughly well rammed. The concrete must be mixed on a wooden or iron platform, and not on the bare ground. The water must not be thrown on in buckets, but sprinkled on through a fine rose. The concrete must be laid down as soon after mixing as possible. In mixing concrete, old material must not be incorporated in the new mixing. All concrete should be laid in boxes made with $1\frac{1}{2}$ in. boards, and no layer should exceed twelve inches in height. Every old layer must be thoroughly cleaned and slightly damped before commencing to add a fresh layer. It is most important that the mixing is thorough, because it is in an imperfectly mixed concrete that cracks and flaws are liable to appear. The best way is to mix the sand and cement together thoroughly in a dry state, then place the stones on the top, mix well together dry, then add the water through the rose of a watering-can, and turn the wetted mass over at least twice before laying. Only

sufficient concrete should be wetted and mixed as is immediately required.

Sometimes in the case of soils liable to much expansion and contraction, a good plan is to lay down a bed of clean, sharp sand, 6 in. or 12 in. thick, on which the concrete is subsequently placed. This better distributes the pressure, and will often prevent unequal settlement. It is also a good plan to reinforce the floor, slope and walls with steel bars, which combine with the concrete in such a way as to prevent fracture. After thoroughly consolidating the ground by ramming, lay the floor of drip yards with 4 in. of concrete as described above, packed to a regular grade and finished with the rammer. After completion, and while yet green, prepare a liquid grout of one part of cement to one of sand, run it over the same, and brush over lightly with a straw or bass broom; form the necessary channels in same for conducting the drippings to the well. All concrete must be kept well watered and covered with damp sacks or grass as the work proceeds, and all walls should be kept well wetted for a week after completion. The floors of tank, race and dripping run should be covered with wet sand for 14 days after completion. The floors of race and dripping run ought to be V jointed, diagonally from the centre to sides every 18 in., joints $\frac{1}{4}$ in. deep. All concrete must be thoroughly well rammed. The concrete must be laid as quickly as possible, and the whole of the materials must be on the ground before commencing to mix them. All concrete should be mixed under supervision, and the contractor should give due notice of his intention to lay the same before commencing work.

Before putting up the framework, lay the floor and inlet and exit slopes with concrete to the dimensions shewn on the drawing, and prepare for same by carefully levelling and driving into the ground fine iron pegs or pins, which should project above the surface of the ground to the face of the concrete; put in similar pins up the slopes. In laying the concrete these will be useful for guides, and for working the straight edge from point to point.

The laying of the floor first is a most important matter, and cannot be too strongly insisted upon, as cracks which have sometimes appeared in the walls have been traced to a departure from the specification in this particular. By laying the floor first, and taking special care at the junction of the slope, a wide slab of concrete is constructed on which the walls are subsequently built, and if the work is well done, any tendency of the superincumbent walls settling will be rendered fairly uniform, and the dangers of irregular settlement considerably minimised. Build in four rows of barbed wire all round the walls—four wires in each row. The first should be placed 12 in. from the floor, then at intervals of 1 ft. 10 in. apart, well tied to iron uprights at the angles. This will further help to prevent irregular settlement taking place. Lay the wires in the position shewn on section, to run right round the tank, and all to unite; top, bottom and side wires. Wire to be four-barb, two-ply, with barbs 6 in. apart. All wiring must be drawn taut.

The surface of floor in race, in dripping run, and bottom of tank must be floated up with one of cement to three of sharp sand, to be well trowelled and brought to a smooth, fine face. The edge of floor of race, at entrance of tank, must be rounded. The surface of slope leading out of tank is to be finished rough, for foothold of cattle, by racking up the surface after ramming or by introducing rails. The floor of dripping run must be 4 in. thick at the sides, and slope ½ in. towards the centre. Near the exit of tank leave a hole in the floor of dripping run, to be 3 in. in diameter, fitted with a 3 in. outlet pipe. Fit a wooden plug with an iron top and ring. The plug must be left in place when dipping, and should be removed during rains to prevent rain water running into the tank. On each side of the dripping run lay a dwarf wall of concrete, to be 6 in. wide, to prevent dip washing over the floor of race when cattle enter the tank. The wall will start from ground level, and will be 12 in. or more at the end near tank. After completion plaster the walls and floors of tank with one of cement and three of sharp sand, steel trowelled, to be not less than ½ in. thick; walls well roughened and wetted before applying the plaster. Plastering should not be attempted in the heat of the day, nor during a frosty morning or evening. The plastering should if possible be completed in one day, and should be applied while the concrete is still "green."

The entrance to the tank has been designed so as to prevent cattle trying to jump out sideways, instead of plunging into the dip. Some tanks are built narrow at the entrance for this purpose and to economise concrete, but this entails additional difficulty and labour in construction, involving more expense. The ledge, which allows of handling stock in difficulties, does not extend the whole length of the tank, but terminates within 9 ft. of the entrance, so as to prevent stock from using it to try to avoid the plunge. Beyond this ledge is the splash wall, which may be built of brick, faced or pointed in cement. All important dimensions are indicated on the drawings, and these should be strictly adhered to, unless it has been decided beforehand to construct the tank to other dimensions. The length of the tank may with advantage be increased by 4, 6 or even 8 ft., ensuring a more thorough soaking of all cattle passing through, and the length shewn in the drawing should be regarded as a minimum. The slope down to the tank is often made much steeper than shewn for the last 2 ft., and given slight steps, which prevent wily and experienced cattle from sliding in gently and launching themselves into the swim without that immersion of the head which is so essential for tick destruction. In several tanks the width at the bottom has been reduced from 2 ft. 3 in., as shewn, to about 1 ft. 9 in., with a view to lessening the quantity of dip in the tank at any one time. This saving is more apparent than real, for the loss of the dip is mainly that removed by each animal, and the main saving is derived from the prevention of splash and of loss in the dripping run and drying pen. The exit should be provided with ridges to give a grip to the feet, for which cement or short lengths of rail, pipes, or 16 lb. fence posts are admirably adapted. The whole of the posts may be of mopani or mohobohobo, or some similarly

suitable native timber, which should not be less than 5 in. diameter at the small end, stripped of bark and well carbolineumed before erecting. The race will be formed of poles or rails as shewn on plan. Posts for yards should be not more than 10 ft. from centre to centre, let into ground 18 in., and well rammed. All posts must be 6 ft. above the ground, and free from knobs or projections. Well spike to posts round the whole of the yards and enclosures three or more $4\frac{1}{2}$ in. by $1\frac{1}{2}$ in. rails, all well carbolineumed before fixing. The posts must be dressed quite clean to prevent injury to cattle. Rails may be deal, clean and free from knobs and splints. Native timber may be used for rails if procurable, but it must be straight and quite free from knobs or projections that might cause injury to animals. A few slip rails should be available in order to prevent cattle from backing out of the entrance race. Such rails might be of smoothed native timber about 4 in. diameter.

Both the entrance race and exit run may be built either straight or curved, as may be found best suited to the site selected and for the arrangement of the kraals. On the accompanying drawing these are for convenience shewn straight.

The dripping run need not necessarily be built as a narrow run all the way as shewn, but may very usefully be widened into a concrete or slab-paved pen or kraal, where a larger number of cattle may be kept and allowed to drip more thoroughly. The arrangement of the kraals is also a matter in which a wide discretion with common sense is permissible, depending on the configuration of the site.

A considerable saving in dip may be effected by extending the dripping pen to 60 or 70 ft. and erecting brick or stone sides, or, where wire is used, by extending the concrete floor about 6 in. outside the line of posts and wire. Recent observations have shewn that the most economical draining arrangement is a large pen with stone or brick walls; this is divided into equal portions by a wall ending about 4 ft. from exit from tank at ground level; at the end of this wall a gate or door is swung to close on either side of the walls or fencing at end of tank; this enables the pens to be filled and evacuated alternately without any loss of time. Each pen should be large enough to accommodate about 30 head.

The size of the collecting kraal will depend upon the numbers to be handled at one time, and as a guide, 18 square feet per beast may be regarded as a convenient allowance, though a kraal 60 ft. by 30 ft. would accommodate about 100 head comfortably. Drinking water should be provided in troughs in this yard, or somewhere convenient for the stock before entering it, as animals entering a dipping tank suffering from thirst are very liable to drink from the dip as they pass through. On leaving the dripping run it is well to keep the herd in a resting kraal till dry to prevent poison being distributed on the surrounding veld. The tank itself should for similar reasons be fenced off from adjacent ground for a distance of about five yards all round. Within this space drums of dip and any appliances used in

dipping may be kept. The tank or sump for the reception of the old dipping fluid when the dipping tank is being cleaned out should be similarly protected. When the walls and floors have become dry, select a warm day with good sunshine, and coat the whole of the floor, exit and inlet slope and walls up to the water line with hot coal tar, well boiled, with 1 lb. of pitch added to each gallon of tar. When the same has become dry it should receive a second coat of the same material, which should be well worked into all corners and angles. This will tend to close the pores and prevent undue absorption. One gallon of tar and 1 lb. of pitch will cover 11 square yards the first coat, and a larger area the second coat. In filling the tank for the first time a certain quantity of fluid will be absorbed and lost through leakage and absorption. These losses, however, may be expected to become reduced as the tank is refilled and the minute particles in the water or dip fill the coarser interstices of the concrete.

The quantities of material required are as follows:—

Pipes—

10 pieces 1½ in. diameter pipe, 6 ft. long, across exit.
1 piece 3 in. diameter pipe, 4 ft. 6 in. long.
1 piece 3 in. diameter pipe, 1 ft. 9 in. long.

Timber—

Rails, 6 pieces 12 ft., 4½ in. x 1½ in.
Rails, 12 pieces 14 ft., 4½ in. x 1½ in.
Rails, 48 pieces 20 ft., 4½ in. x 1½ in.
Slip rails, 6 pieces 10 ft., 3 in. x 3 in.
Slip rails, 3 pieces 15 ft., 3 in. x 3 in.
80 posts, 5 in. diameter, 7 ft. 6 in. long.
30 posts, 5 in. diameter, 8 ft. long.
9 pieces, 15 ft. long, 9 in. x 1½ in., deal.
3 pieces, 17 ft. 6 in. long, 9 in. x 1½ in., deal.
4 pieces, 11 ft. long, 9 in. x 1½ in., deal.
2 pieces, 7 ft. long, 9 in. x 1½ in., deal.

(Native wood may be used in the place of imported timber.)

1½ coils barbed wire.
15 gallons carbolineum.
50 lbs. 5 in. spikes.
44 casks (88 bags) cement.
33 cubic yards broken stone.
24 cubic yards sand.
1,600 bricks.

The entrance race should, where possible, incline slightly upwards to within a short distance of the tank so as to keep back dirt, dung and liquid from polluting the tank, and the last few feet only incline towards the tank. This is shewn on the drawings, but may not always be practicable. The slight bar shewn at the very commencement of the concrete race is often overlooked. This is very essential to prevent flood water coming into the tank from the direction of the collecting

kraal. In a very complete tank lately built, the cattle in passing along the race from the collecting kraal to the tank are made to walk through a concrete foot-bath or trough a few inches deep filled with water so as to clean their feet and prevent the mud sticking to them from entering the tank and polluting the dip. The entrance race must be strongly built to withstand the pressure of the cattle, and may either consist of rails of native wood, not more than one foot apart, or of $1\frac{1}{2}$ in. boards. The wings extending from this fence over the tank should be made of planks to prevent animals seeing out over the side, and so being tempted to get out that way. The posts must be securely fixed and supported with strong stays. Old rails are often used for this purpose. The dripping run should not be less than fifteen yards long, and additional length implies further saving in the dip draining off, especially where large numbers are to be handled and the animals are not allowed to stand in this run. The return of dip from the dripping run into the tank and the diversion of rain water falling on the race are provided for by pipes through the kerb edge, one leading outwards, the other passing back into the tank as shewn on the drawings. Another method is to carry a pipe through the kerb into a small settling cistern (say, 12 in. x 18 in. x 24 in. deep) constructed alongside the dripping run, and out of which a second pipe leads back into the tank at a lower level after sediment has been deposited. By means of wooden plugs, the dip or rain water from the dripping run may be carried into the tank or drained away. At the exit the barrier between the dipping run and the tank is usually made too small to divert rain water from entering the tank on that side, an accident likely to occur, as the drying kraal is generally placed on a slope above the tank. This inflow of storm water must be guarded against, as it fills the tank with dirty water and leads to complete confusion as to the strength of the solution in use. Care at the outset on these details saves much subsequent trouble.

A pulley tackle is a great convenience for dealing with obstreperous beasts. The rope may either be adjusted round the horns, or a large loop carried right over the back, under the tail, and along the flanks, a method which renders resistance of little avail.

The following schedule gives the approximate capacities of a tank built strictly to the dimensions shewn on the drawing, but as it is only in very rare instances that tanks are built exactly to these dimensions, it should serve as a guide only, and is not to be relied upon when mixing the dip. The only accurate method of ascertaining the capacity of any dipping tank is by means of introducing the dip (or water) from a smaller tank (or buckets) of known dimensions. A tank of, say, 100 gallons capacity could be erected in such a position that its contents can be emptied into the dipping tank. The level attained by each emptying, which in this case is equivalent to 100 gallons, can then be indelibly marked on the side of the tank or on a gauge post placed in the tank.

Depth. Ft.	In.	Gallons.	Depth. Ft.	In.	Gallons.
0	0	0	4	$0\frac{3}{4}$	1,600
0	$4\frac{3}{4}$	100	4	$2\frac{3}{4}$	1,700
0	9	200	4	$4\frac{3}{4}$	1,800
1	$0\frac{3}{4}$	300	4	$6\frac{1}{2}$	1,900
1	$4\frac{1}{2}$	400	4	$8\frac{1}{4}$	2,000
1	8	500	4	10	2,100
1	$11\frac{1}{2}$	600	4	$11\frac{1}{2}$	2,200
2	$2\frac{1}{2}$	700	5	1	2,300
2	$5\frac{1}{2}$	800	5	$2\frac{1}{2}$	2,400
2	$8\frac{1}{2}$	900	5	4	2,500
2	$11\frac{1}{4}$	1,000	5	$5\frac{1}{2}$	2,600
3	$1\frac{3}{4}$	1,100	5	7	2,700
3	4	1,200	5	$8\frac{1}{2}$	2,800
3	$6\frac{1}{4}$	1,300	5	10	2,900
3	$8\frac{1}{2}$	1,400	5	$11\frac{1}{2}$	3,000
3	$10\frac{3}{4}$	1,500	6	0	3,060

Hints on Dipping.—As proprietary dips are now generally used instead of the arsenite of soda or Natal Laboratory dip, it is only necessary to state that full instructions are supplied with each tin, and these should be rigorously adhered to.

In order successfully to accomplish the object for which the process is practised, viz., the destruction of ticks, it is essential that the fluid be maintained at the proper strength. If it falls below this, ticks are not destroyed, and so much time and money are wasted; if it becomes too strong much injury may be caused to the animals dipped, and in some cases serious mortality may ensue.

The strength of the fluid is altered by evaporation or by addition of water. It is pure water only which evaporates, and evaporation, therefore, results in an increase of the strength of the remaining fluid. The addition of rain and flood water naturally causes a diminution in the strength of the fluid. If the following procedure is faithfully adhered to, the strength of the fluid will be maintained at, or sufficiently near for practical purposes, the proper strength. After each dipping the depth of the fluid in the tank should be accurately measured, and the result recorded in a book specially kept for the purpose; it is fatal to trust to memory in a matter of this sort, where the result may be so serious. Immediately before the next dipping the depth should again be measured, and any difference in the quantity of the fluid accurately calculated. If there has been a decrease, water alone to the extent of same should be added. If there has been an increase, dip should be added in proper quantity to make such increase equal in strength to that which is being used in the tank. On no account should this procedure be omitted even where the increase or decrease is small, because the repetition of such must result either in the fluid becoming so weak as to be useless, or so strong as to be injurious and even fatal.

Each animal that passes through the tank takes with it a quantity

of the fluid, estimated at between half and one gallon; the level of the fluid in the tank is thus gradually lowered. To make up this deficiency, water with dip in the proper proportion must be added.

The chief reason for dipping is the destruction of ticks, which are transmitters of various diseases, amongst which in cattle may be mentioned African Coast Fever, Gall-sickness and Redwater. It is, however, against the spread of Coast Fever infection by this agency that dipping is now so largely practised. But it has been found that the dipping of cattle has many other advantages. Apart from the disease-bearing capacities of ticks, it is evident that their presence on animals is a serious drawback, chiefly because of the large quantities of blood extracted, which should go to growth, or to improvement in condition, or to the increase of the milk supply. Not the least of the benefits of dipping is the reduction of the mortality amongst calves from white scour, liver disease, etc. Instances can be given where such mortality has been reduced from 60, 70 or even 80 per cent. to nil.

Apart from Coast Fever areas, where short intervals are necessary, dipping as a general measure should be practised every seven days. Fortnightly dipping, or dipping only when ticks are seen on the animals, is of very little value. This is evident when it is considered that our most dangerous ticks, *i.e.*, those which transmit Coast Fever, only remain on an average four days on the bovine host. In many cases animals which to the eye are apparently free from ticks will on close examination be found to harbour large numbers of the larvæ and nymphal forms, especially in the ears, where some of the Coast Fever-bearing ticks are most commonly found. It should be remembered that the ticks most commonly seen are the engorging females, that the males are small, and on a beast with an average coat not easily seen.

It is advisable to give working cattle a day's rest after immersion in the tank, but some farmers inspan them as soon as the skin is thoroughly dry. Where seven-day dipping is practised, the dipping can be carried out on the Saturday afternoon, thus giving the animal at least $1\frac{1}{2}$ days to recover.

Opinions vary as to the effect of dipping on milch cows. Some assert that the quantity of milk is decreased to a large extent for 24 hours, and even longer, after dipping; others say that the effect in this respect is not appreciable. Assuming, however, that there is a slight immediate loss, it should be remembered that there is a general increase because of the better condition of the animals as the result of regular dipping.

MANAGEMENT OF DIPPING TANKS.

By J. M. Sinclair, Chief Veterinary Surgeon.

In a paper entitled "Notes relating to Arsenical Dipping Fluids," by Mr. A. G. Holborow, F.I.C., Assistant Agricultural Chemist, which appeared in the December, 1915, issue of the *Journal*, it is stated that

Depth. Ft.	In.	Gallons.	Depth. Ft.	In.	Gallons.
0	0	0	4	0¾	1,600
0	4¾	100	4	2¾	1,700
0	9	200	4	4¾	1,800
1	0¾	300	4	6½	1,900
1	4½	400	4	8¼	2,000
1	8	500	4	10	2,100
1	11½	600	4	11½	2,200
2	2½	700	5	1	2,300
2	5½	800	5	2½	2,400
2	8½	900	5	4	2,500
2	11¼	1,000	5	5½	2,600
3	1¾	1,100	5	7	2,700
3	4	1,200	5	8½	2,800
3	6¼	1,300	5	10	2,900
3	8½	1,400	5	11½	3,000
3	10¾	1,500	6	0	3,060

Hints on Dipping.—As proprietary dips are now generally used instead of the arsenite of soda or Natal Laboratory dip, it is only necessary to state that full instructions are supplied with each tin, and these should be rigorously adhered to.

In order successfully to accomplish the object for which the process is practised, viz., the destruction of ticks, it is essential that the fluid be maintained at the proper strength. If it falls below this, ticks are not destroyed, and so much time and money are wasted; if it becomes too strong much injury may be caused to the animals dipped, and in some cases serious mortality may ensue.

The strength of the fluid is altered by evaporation or by addition of water. It is pure water only which evaporates, and evaporation, therefore, results in an increase of the strength of the remaining fluid. The addition of rain and flood water naturally causes a diminution in the strength of the fluid. If the following procedure is faithfully adhered to, the strength of the fluid will be maintained at, or sufficiently near for practical purposes, the proper strength. After each dipping the depth of the fluid in the tank should be accurately measured, and the result recorded in a book specially kept for the purpose; it is fatal to trust to memory in a matter of this sort, where the result may be so serious. Immediately before the next dipping the depth should again be measured, and any difference in the quantity of the fluid accurately calculated. If there has been a decrease, water alone to the extent of same should be added. If there has been an increase, dip should be added in proper quantity to make such increase equal in strength to that which is being used in the tank. On no account should this procedure be omitted even where the increase or decrease is small, because the repetition of such must result either in the fluid becoming so weak as to be useless, or so strong as to be injurious and even fatal.

Each animal that passes through the tank takes with it a quantity

of the fluid, estimated at between half and one gallon; the level of the fluid in the tank is thus gradually lowered. To make up this deficiency, water with dip in the proper proportion must be added.

The chief reason for dipping is the destruction of ticks, which are transmitters of various diseases, amongst which in cattle may be mentioned African Coast Fever, Gall-sickness and Redwater. It is, however, against the spread of Coast Fever infection by this agency that dipping is now so largely practised. But it has been found that the dipping of cattle has many other advantages. Apart from the disease-bearing capacities of ticks, it is evident that their presence on animals is a serious drawback, chiefly because of the large quantities of blood extracted, which should go to growth, or to improvement in condition, or to the increase of the milk supply. Not the least of the benefits of dipping is the reduction of the mortality amongst calves from white scour, liver disease, etc. Instances can be given where such mortality has been reduced from 60, 70 or even 80 per cent. to nil.

Apart from Coast Fever areas, where short intervals are necessary, dipping as a general measure should be practised every seven days. Fortnightly dipping, or dipping only when ticks are seen on the animals, is of very little value. This is evident when it is considered that our most dangerous ticks, *i.e.*, those which transmit Coast Fever, only remain on an average four days on the bovine host. In many cases animals which to the eye are apparently free from ticks will on close examination be found to harbour large numbers of the larvæ and nymphal forms, especially in the ears, where some of the Coast Fever-bearing ticks are most commonly found. It should be remembered that the ticks most commonly seen are the engorging females, that the males are small, and on a beast with an average coat not easily seen.

It is advisable to give working cattle a day's rest after immersion in the tank, but some farmers inspan them as soon as the skin is thoroughly dry. Where seven-day dipping is practised, the dipping can be carried out on the Saturday afternoon, thus giving the animal at least $1\frac{1}{2}$ days to recover.

Opinions vary as to the effect of dipping on milch cows. Some assert that the quantity of milk is decreased to a large extent for 24 hours, and even longer, after dipping; others say that the effect in this respect is not appreciable. Assuming, however, that there is a slight immediate loss, it should be remembered that there is a general increase because of the better condition of the animals as the result of regular dipping.

MANAGEMENT OF DIPPING TANKS.

By J. M. Sinclair, Chief Veterinary Surgeon.

In a paper entitled "Notes relating to Arsenical Dipping Fluids," by Mr. A. G. Holborow, F.I.C., Assistant Agricultural Chemist, which appeared in the December, 1915, issue of the *Journal*, it is stated that

"it should be an easy matter, knowing the volume of liquid in the tank and the exact strength of it, to rectify any deviation by adding water only, or dip, as the case may be, and bring the dipping fluid to any desired strength." The writer agrees entirely with this view, but his experience shews that many owners and managers of tanks find a considerable difficulty in doing so. In some cases the reason is that the capacity of the tank inch by inch is not known, or, if known, is not made use of in calculating the quantity of water or dip required to bring the liquid in the tank to the proper strength. In other cases, the quantities are calculated in a haphazard or crude manner, with the result that the strength may be so increased as to cause damage to the cattle, or so diminished as to be ineffective. The tendency in the majority of cases is in the latter direction, probably because the persons concerned, not being quite sure of their quantities, prefer to err on the side of safety.

The following notes on the management of the dipping solution and dipping tanks generally will, it is hoped, be of some assistance to stock owners.

1. At the first filling the water should be measured into the tank by a 200 gallon or other convenient measure.

2. From the 3 feet 6 inches level the volume, inch by inch, should be carefully recorded and marked on the wall of the tank, or preferably on a measuring rod, which can be obtained at a small cost.

3. The level should be recorded after each dipping and again before the following one.

4. Any decrease due to evaporation should be replaced by water only.

5. Any increase due to rain or flood water should be made up to standard strength by the addition of the corresponding quantity of dip.

6. When a sample is taken for analysis the quantity of solution in the tank at the time should be accurately estimated, otherwise it is impossible to rectify any excess or diminution of strength shewn by such analysis.

7. The following example is given of correcting the strength of the solution in the tank on receipt of the result of the analysis:—

(a) capacity of tank at proper dipping level—3,000 gals.;

(b) prescribed strength of dip used—say, 1 to 150 gals. of water;

(c) quantity of solution in tank at date sample was taken—say, 2,400 gals.;

(d) assume analysis shews strength—1 in 200;

(e) then the 2,400 gallons in tank contain 12 gallons of dip only, instead of 16 gallons; therefore, 4 gallons of dip must be added to bring the solution up to proper strength;

(f) there remain the 600 gallons of water required to bring the volume in tank up to the proper dipping level; this requires another 4 gallons of dip;

(g) the total quantity of dip, therefore, which is required to rectify the diminished strength of the solution in the tank, and provide for the 600 gallons of additional water added to the tank, is 8 gallons.

8. Where necessary, the tank should be protected by drains, to prevent the dip being flooded out on to the surrounding veld.

9. When not in use, the entrance and exit of kraals and draining pens should be properly secured.

10. The draining pens should be so constructed that dip cannot collect in them.

11. The drums, whether closed or not, containing the concentrated dip should be kept under lock and key.

12. When emptied, the drums should be immediately and thoroughly washed, and the washings placed in the tank or buried.

13. Where kraals are used in addition to draining pens, in order to allow cattle to drip and dry completely, cattle should not be allowed into them until any water which may have collected in pools has been dispersed.

14. Tanks should be so protected by fencing that animals cannot have access to any ground contaminated with arsenic from splashings during dipping and leaking draining pens.

CATTLE CLEANSING ORDINANCE, 1918.

The attention of stockowners in areas in which the above Ordinance is now in force is directed to sections 5 and 6 thereof, which provide that cattle shall be cleansed by dipping at regular intervals of seven days in an "effective tick-destroying agent." An effective tick-destroying agent is defined as "an aqueous solution containing the equivalent of .16 per centum of arsenious oxide, or such other percentage of arsenious oxide or such other ingredients in such proportion as the Administrator may from time to time prescribe by notice in the *Gazette*." It is not intended to vary the percentage of arsenious oxide defined above, and to conform to this standard the following dilutions of the dips now commonly used are required:—

(1) *Arsenite of Soda.*

8 lbs. of arsenite of soda (80% arsenious oxide) to every 400 gallons of water.

(2) *Cooper's Improved Cattle Dip.*

1 gallon of dip to every 156 gallons of water.

(3) *Arsenoda Cattle Dip.*

1 gallon of dip to every 350 gallons of water.

(4) *St. O'Gorman Cattle Dip.*

1 gallon of dip to every 200 gallons of water.

(5) *"Champion" Arsenical Cattle Dip.*
1 gallon of dip to every 300 gallons of water.

All Government Notices relating to the strength of cattle dips have been cancelled, and all departmental notices relating to the same are hereby cancelled.

J. M. SINCLAIR,
Controller of Stock.

ARSENITE CATTLE DIP.

How to Mix.

First dissolve the arsenite in a sufficient quantity of hot water to dissolve the crystals completely. Then add water to make up to 400 gallons, stirring vigorously the while.

Although it will probably be found most convenient to dissolve the arsenite in a few gallons of hot water, this may be carried out in a short time with cold water in the following manner:—

Place two or three pounds of arsenite in a bucketful of water and stir vigorously for five or ten minutes. Allow any undissolved particles to settle, and pour off the liquid into a tank. Then add more arsenite to that remaining in the bucket and fill up with water again; repeating this till all the arsenite is dissolved.

Have proper weights and scales, and be accurate in measuring the arsenite. Always keep arsenite under lock and key as a dangerous poison. All arsenite must be completely dissolved before being added to the dipping tank.

Solutions prepared as above can be added to tanks now containing arsenical proprietary dips.

For three-day dipping—

4 lbs. arsenite of soda (80% arsenious oxide) to every 400 gallons of water.

For seven-day dipping—

8 lbs. of arsenite of soda (80% arsenious oxide) to every 400 gallons of water.

WASTAGE OF DIP IN DIPPING OPERATIONS.

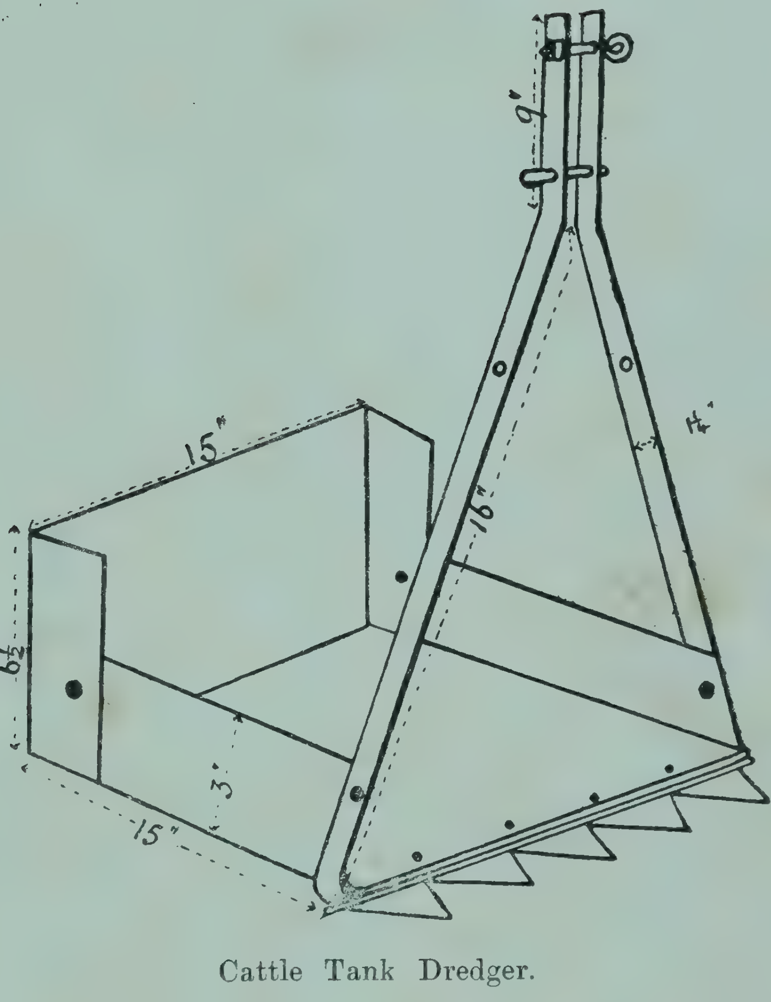
By J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

Owing to the high cost of cattle dip, the conservation of fluid by the use of adequate draining pens is a matter of pounds, shillings and pence, and, as it will probably be a long time before prices come down to pre-war rates, tank owners would be well advised to consider the draining arrangements at their tanks with a view to reducing wastage to a minimum.

DRAWING
OF
DIPPING TANK

Scale: 1/4 inch = 1 foot

'd Wall



Cattle Tank Dredger.

The following observations made by the Department shew that proper draining accommodation means a saving of many pounds per annum:—

Tank.	Drainage.	No. of cattle.	Wastage in gallons.
1	Large single pen	1,250	480
2	Double pen	680	200
3	Race 34 feet	603	300
4	Race 30 feet	1,004	720
5	Race 60 feet	1,200	400
6	Race 60 feet	1,643	385
7	Race 72 feet	1,650	290
8	Race 72 feet	1,635	300

In considering these quantities, the size of the cattle must be taken into consideration. At tanks Nos. 1, 3 and 4, which are on or adjoining Salisbury commonage, dairy cattle predominate, and the number of small animals, *i.e.*, calves, yearlings and two-year-olds, will therefore be greater than in the average herd of farm cattle. The cattle at No. 2 tank are highly graded throughout, and the average size is considerably larger than in the average herd of farm cattle. At tanks Nos. 5 to 8 inclusive the animals are of the small Mashona type. The double draining pen and the long draining races are very economical; in the latter the wastage is governed largely by the speed at which the cattle are driven through. The single draining pen can be made as economical as any other plan, but only by a considerable wastage of time.

DIRECTIONS FOR TAKING SAMPLES OF DIP.

Taking a sample of dip requires care, and should never be left to a native. Thoroughly cleanse a bottle of the "whisky" size. When the contents of the tank have been thoroughly stirred, preferably by the actual dipping of cattle, rinse out the bottle with solution from the tank. Then fill the bottle completely with solution, cork securely, and *stick on the bottle* a label stating sender's name, farm, postal address, kind of dip used, and the date on which the sample was taken.

It is not necessary to send a covering letter, except when special information in addition to the analysis is required.

When it is expected that the sample will take a week or more to reach the laboratory, it is wise to add about 10 spots of sulphuric acid (free from arsenic), to prevent oxidation *en route*.

A farmer should not expect the Chemist's analysis to save him the trouble of keeping account of the amount of water and dip added to or lost from his tank.

A DIP-TANK DREDGER.

Dipping tanks in use always tend to accumulate a quantity of sediment at the bottom. Though this cannot be avoided, the deposit should be cleaned out as often as possible, because not only is it objectionable to use a filthy dipping fluid, but if the slime or mud is left undisturbed week after week, it soon increases sufficiently to reduce appreciably the capacity of the tank. The result is that measurements of the quantity of solution present, based on fixed marks on the tank wall, cease to be accurate, and any estimate of the amount of chemical dip, or water, to be added will be unreliable, so that it becomes impossible to keep the solution at the right strength. The danger of this state of affairs is obvious, and the only remedy is to clean out the tank regularly.

In order that this may be done without emptying the receptacle, several devices have been tried with varying success. One of the best, which is in use in the Salisbury district, is shewn in the accompanying diagram, which gives the approximate dimensions. Little further description is necessary beyond saying that the material of the scoop is thin sheet iron rivetted as shewn, the front edge is armed with part of an old mower blade rivetted in place, the two bent stays are made of flat iron, and the two bolts shewn near the top are for holding in position a vertical pole about 10 feet long. On the oblique part of the stays will be seen two small holes drilled in the flat iron. These are for the reception of two lengths of strong wire.

The method of use is as follows:—The scoop is dropped to the bottom near the middle of the tank, being kept in place by the upright pole held by a man standing on the top of the wall. At the plunge end, two persons hold the ends of the long wires ready to pull. As soon as a strain is put on the wire, the pole-holder may, if necessary, give the scoop a slight forward tilt to cause the mower teeth to enter the mud. When the scoop is full, it is lifted out at the plunge end by means of the two wires and the pole, the latter being now slightly tilted backwards. The process is repeated as often as possible, working always towards the plunge end of the tank, where the greatest mass of deposit will be found. It would be an advantage if the tank were dredged after every dipping day, especially where large numbers of cattle are put through, but this is not absolutely necessary, and in practice it is only used occasionally as the sediment collects.

CATTLE CLEANSING ORDINANCE, 1918.

(Ordinance No. 9, 1918—Promulgated 27th September, 1918.)

An Ordinance to provide for the cleansing of cattle.

BE IT ENACTED by the Administrator of Southern Rhodesia, by and with the advice and consent of the Legislative Council thereof, as follows:—

1. In this Ordinance, if not inconsistent with the context, the following terms shall have the meanings set opposite to them respectively:—

(1) "cattle" shall mean bulls, cows, heifers, calves and oxen;

(2) "engorged tick" shall mean any tick obviously distended with blood;

(3) "tick-infestation" shall mean having ten or more engorged ticks not being bont (*amblyomma hebræum* or *variegatum*) or bont-legged (*hyalomma ægyptium*) ticks;

(4) "to clean" shall mean the maintaining of cattle free from tick-infestation by submerging such cattle in a dipping tank containing an effective tick-destroying agent;

(5) "dipping tank" shall mean any contrivance for the cleaning of cattle by submerging, and structures incidental thereto;

(6) "effective tick-destroying agent" shall mean an aqueous solution containing the equivalent of .16 per centum of arsenious oxide, or such other percentage of arsenious oxide or such other ingredients in such proportion as the Administrator may from time to time prescribe by notice in the *Gazette*;

(7) "owner," as applied to land, shall include—

(a) any person, company, co-partnership or public body in actual occupation of or entitled as owner to occupy any land, or the representative of any such company, co-partnership or public body;

(b) persons holding land from the British South Africa Company by virtue of a right commonly known as a Permit of Occupation;

(8) "owner," as applied to cattle, shall include every person claiming jointly or severally any right, title or interest in any cattle in his possession, or having charge, control or management of cattle, as well as the owner of land in respect of cattle belonging to his servants and running on such land.

2. From and after the promulgation of this Ordinance all owners of cattle in areas in which the "Compulsory Dipping Ordinance, 1914," is in force, and from and after a date to be fixed by the Administrator by a notice in the *Gazette*, all owners of cattle, in areas other than those exempted in terms of section eight hereof, shall be required to clean their cattle.

3. The Administrator may appoint a sufficient number of officers to be styled inspectors for the purposes of this Ordinance.

4. Every inspector shall have full power and authority to inspect any cattle at any time and to take a sample or samples from the contents of any dipping tank. Any person who shall refuse to allow any inspector to enter upon any land or premises or to examine cattle, or who shall impede or hinder or attempt to impede or hinder any such inspector in the execution of his duties, shall be liable to a fine not

exceeding £20, or in default of payment to imprisonment, with or without hard labour, for a period not exceeding three months.

5. An owner who shall fail to clean his cattle, in areas not exempted in terms of section eight hereof, shall be liable to a fine not exceeding £100, or in default of payment to imprisonment, with or without hard labour, for a period not exceeding twelve months.

6. The owner of cattle, notwithstanding that such cattle are free from tick-infestation, shall be liable to the penalties prescribed in the last preceding section if it is shewn that he has failed to clean them at regular intervals of seven days; provided always that should it appear that it was impossible or inexpedient to clean such cattle within seven days, the onus of proof of which shall be on the owner, the said interval may be exceeded, but in no case beyond fourteen days in all.

7. The Chief Veterinary Surgeon or any person duly authorised by him thereto in writing may, for considerations of weather, drought or condition of the cattle, or for other causes beyond the control of the owner, temporarily exempt owners in any areas from the provisions of section six hereof, and may during such period prescribe the interval of cleaning. A list of all exemptions granted under this section shall be posted, whilst in operation, at the Magistrate's office and all police stations in the district and at the cattle inspector's office in the area in which the cattle affected are located. No movement of cattle shall be permitted from any area in which exemption from dipping under this section is in force unless the cattle are twice cleaned within fourteen days immediately prior to removal.

8. The Administrator may, by notice in the *Gazette*, temporarily exempt persons living in native reserves or other areas chiefly inhabited by natives from the obligations of sections five and six hereof until such time as the Administrator may be satisfied that arrangements have been made to clean the cattle in such areas.

9. No movements of cattle from areas exempted in terms of section eight hereof shall be permitted except at ports of exit fixed by the Administrator by notice in the *Gazette*, after such period of detention and cleaning at such ports as may be from time to time prescribed.

10. The owners of land on which native owners of cattle reside may be required by the Administrator to provide facilities, including the erection and maintenance of dipping tanks and the provision of effective tick-destroying agents, for the cleaning of such cattle on terms and conditions to be approved of by him. Any owner of land failing to make provision as aforesaid shall be liable to a fine not exceeding £20, or in default of payment to imprisonment, with or without hard labour, for a period not exceeding three months, but the payment of such fine or the undergoing of such imprisonment shall not relieve the said owner of his obligation to provide the said facilities.

11. Should any person, company or co-partnership own land with cattle thereon, the property of such person, company or co-partnership, and be absent from or not have a representative or agent in this Territory having authority to carry out the terms of this Ordinance, the

Administrator may authorise the due performance of the terms of this Ordinance in such manner as he may deem expedient, and any disbursements thereby incurred shall be recoverable by summary sale by auction of sufficient cattle and goods, the property of such person, company or co-partnership, to repay the said disbursements.

12. The Administrator may, except in such areas as are exempted under section eight, require any owner to construct a dipping tank at his own expense upon his land, and may require persons living in native reserves to construct dipping tanks thereon at their own expense.

13. Persons furnishing loans for the purpose of erecting dipping tanks may, with the consent of the owner, cause a notice in writing to be sent to the Registrar of Deeds of the amount due by such owner, and the Registrar shall make an entry thereof in respect of the land affected. Such entry shall constitute a hypothecation of the land, ranking from the date on which the entry was made and for the amount therein stated; provided that the said Registrar may pass transfer of land so hypothecated if the transferee agrees in writing that any sums due and unpaid shall remain and be registered as a charge against the said land.

14. When any dipping tank is constructed in an area where compulsory dipping is in force by an owner—

(1) upon land held by any person as a tenant, such tenant shall pay yearly during the continuance of his lease the interest, calculated at six pounds per centum per annum, upon the cost of construction; provided, however, that no tenant whose unexpired term of lease does not exceed one year shall be liable to pay such interest;

(2) upon land occupied by any person having a right to purchase such land, such person shall pay yearly during the continuance of his occupancy the interest, calculated at six pounds per centum per annum, upon the cost of such construction, and shall, on completion of the purchase, pay in augmentation and as part of the purchase money the cost of such construction.

15. The Administrator may provide dipping tanks for the common use of owners, and fix or approve a scale of fees for the dipping of animals in such tanks.

16. The Administrator may frame regulations providing generally for the better carrying out of the objects and purposes of this Ordinance. Any person contravening the provisions of any regulation as aforesaid shall be liable to a fine not exceeding £20, or in default of payment to imprisonment, with or without hard labour, for a period not exceeding three months.

17. The "Compulsory Dipping Ordinance, 1914," is hereby repealed.

18. This Ordinance may be cited as the "Cattle Cleansing Ordinance, 1918."

Destruction of Baboons.

In March, 1916, in view of the great damage done by baboons to standing crops, correspondence was instituted by the Department of Agriculture with farmers in various districts in order to ascertain to what extent men with local experience had succeeded in dealing with the pest. It was rumoured that a farmer in North Mazoe had destroyed 150 baboons by one poisoning, and it was hoped to get an account of his method, so that it could be published for the benefit of all. This rumour was never confirmed.

Efforts were then made to discover how these vermin had been dealt with in other parts of South Africa. It was found that large numbers of baboons had been killed by the Cape Forest Department by means of red lead mixed with pine seed and sown broadcast. The baboons uncovered and ate the seed, with fatal results. But a serious disadvantage in the use of red lead is that the poisoned animals invariably make for the nearest water, where they die and pollute the streams. The Union Department of Agriculture was approached and asked for information. The reply was that the destruction of baboons by poisoning had not been found practicable in the south, and the most efficacious method known was by means of organised drives.

The subject was taken up by the Rhodesia Agricultural Union at the Annual Congress in 1917, and the Government was requested to devise some scheme, in co-operation with the settlers, for the destruction of baboons. The advice and assistance of the Native Department was then sought, and a number of drives were carried out with varying success.

As a result of the experience gained during the first year, the whole matter was put on a definite and authoritative basis by the issue of the following circular by the Director of Agriculture in July, 1918:—

"It has been arranged that assistance to farmers to organise hunts for the destruction of baboons will be given on the following lines:—

"1. Applications for assistance should be addressed to the Native Commissioner of the district.

"2. In the event of a hunt being decided upon, the Native Commissioner will arrange for the co-operation of such natives as may be necessary or available.

"3. The hunt will be under the control of the Native Commissioner or some other person appointed by him.

"4. Lee-Enfield ammunition will be issued by the Native Commissioner free, to be accounted for by the user, and any unexpended rounds must be returned to the Native Commissioner. Ammunition for

other rifles or for shotguns, actually expended during the hunt, will be paid for on application to the Civil Commissioner of the district, on production of vouchers duly certified by the Native Commissioner under whose control the hunt was conducted. This arrangement will remain in force until further notice."

This circular is still in force, and some account can now be given of the results obtained under the system.

From 13th September, 1918, to 13th February, 1919, twenty-three drives were carried out in eight different districts. A few of the drives were failures, owing in one case to the arrival of the European guns on the scene being too late. In other cases the results were poor, but the general effectiveness of the method is shewn by the following figures:—In twenty-three drives 1,069 baboons were killed and accounted for, besides many others that were wounded and probably died. This makes an average of over forty-six deaths per drive. The total cost to the Government worked out at £45 16s., about £1 19s. 9d. per drive, and less than 10½d. per baboon killed.

It is obvious that, although the total of animals killed is small relatively to the whole baboon population, the results have been satisfactory, if measured by the amount of time and money spent on the drives. The method of "driving" is also proved to be both effective and economical. It is equally plain that if the baboon pest is to be appreciably reduced throughout the country, it can only be done by a great extension of and a continual persistence in the "drive" method. This calls for much energy and the exercise of some initiative on the part of the farmers. The Government stands ready to help, but without the consistent and hearty co-operation of farmers, little appreciable reduction of the pest can be looked for.

The following points may be noted for the information of those who wish to organise drives. The assistance of natives is essential, and, although they also benefit from the destruction of baboons, some encouragement is usually required to secure their services in sufficient numbers. It has been found that the slaughter of an ox for them at the end of a successful hunt acts as a useful incentive. Dogs have proved to be a great help, and as many as possible should be brought to each drive. The drive must be most carefully organised, the Native Commissioner or some experienced farmer being in charge. The sleeping place of the baboons should, if possible, be surrounded during the night by the natives, under the guidance of men well acquainted with the locality. Above all, the greatest possible number of armed Europeans must be on the spot early, before dawn, and must be properly distributed round the circle of beaters.

If the farmers choose to take the matter up energetically, and arrange for, not one, but several drives in each district every season, there can be little doubt that the baboon pest can be greatly reduced or kept within controllable limits.

Although poisoning is, for several reasons, not recommended in a general way, the results recently obtained by Mr. C. B. Herbst, of

Craiglea Farm, Bulawayo district, are worthy of record. As reported to us, he proceeded as follows:—He boiled two pounds of sugar with water, and upon the mixture cooling, stirred in one pound of arsenite of soda. He had gathered a number of ripe kaffir oranges (*strychnos*), and into each "orange" he squirted not more than a dessert spoonful of the poison, and placed the fruit in the haunts of the baboons. As a result, 125 dead baboons were counted, and the natives reported a further 20 corpses. The cost of operations was 5s.

Departmental Correspondence.

Under this heading we publish correspondence between farmers and the technical officers attached to the Department of Agriculture, containing information which may be of interest and assistance to our readers.

POMEGRANATES.

The following information was sent in by Mr. J. J. Little, of Mnondu Farm, Bulawayo:—

"This district has been bad with diarrhœa amongst calves; lost five early in season; tried all patent medicines—at 10s. 6d. per dop bottle—all useless. Knowing Asiatics use pomegranate rind for dysentery, thought I would try it, as it was only the difference of quantity used. Have not lost a single calf since, and every calf born this year suffers more or less. I have given all my neighbours some, and it is successful with them.

"Twelve rinds of large pomegranates to a gallon of water; boil for one hour. Dose: one breakfast cup; repeat if required, but seldom requisite."

This was communicated to the Chief Veterinary Surgeon, who supplied the following note:—

"The dried bark of the stem and root of the pomegranate is considered a valuable astringent in dysentery and diarrhœa, and in large doses—as a decoction—it kills the tape worm. It is evident from Mr.

Little's experience that the fruit also possesses astringent properties. The Chief Veterinary Surgeon would be glad to hear from other stock-owners who have tried this simple remedy."

WILD RAPOKO GRASS.

A specimen of this grass was sent for identification, and the Assistant Agriculturist replied as follows:—

"The grass sent is technically named *Eleusine indica* (Gaertn.). It is commonly and correctly known as 'wild rapoko,' for it is believed to be the wild form from which rapoko has been cultivated, the scientific name of the latter being *Eleusine corocana* (Gaertn.).

"*Eleusine indica* is indigenous throughout the tropics of the old world, and has been introduced into the new world.

"Our local experience of it here is that it flourishes on waste places and by road-sides particularly, but does not freely invade the veld. It is much relished by all stock, and poultry (especially turkeys) are very fond of the seed. It keeps green until the first frost, which kills it, but stock continue to feed on its withered herbage. It appears to mature towards the end of the rains.

"The native grasses are being experimented with at the Salisbury Experiment Station, and the 'wild rapoko' will be included this year.

"Specimens and notes on useful grasses and other plants with native names will always be welcomed by this Department."

Show Dates.

Place. Dates. Days. Entries close.

Bulawayo—May 26, 27, 28—Mon., Tues., Wed.—May 10 (no late entries)
(Sale, 29)
Gwelo—June 4 and 5—Wed., Thurs.
Umtali—June 27 and 28—Fri., Sat.
Rusape—July 4 and 5—Fri., Sat.
Salisbury—Aug. 20, 21, 22—Wel., Thurs., Fri.—July 31 (no late entries)
Bulawayo—Sept. 2 (Sale, 3)—Tues.
Johannesburg—Sept. 10 and 11—Wed., Thurs.

The Agricultural Outlook.

Reports as to farming prospects at date are uniformly good. Stock is everywhere in good condition, and comparatively little sickness is reported. Crops of all kinds are in a forward state, and shew promise of abundant harvest. The maize belt is expected to produce a record crop. Reports from the tobacco districts speak of the crops being the best for several years past. Potatoes, silage crops and other side lines are all promising well, and the only unfavourable aspect of the season is that the rains, which at first threatened to be too heavy, have in some districts proved to be somewhat less than requirements. This may cause the yield of certain crops to fall below expectations, and possibly the pastures will not carry through winter so well as last year. The 1918-19 growing season has been an excellent one, and we wish we could describe it as average or normal.

Veterinary Report.

January, 1919.

AFRICAN COAST FEVER.

Victoria District.—A recrudescence of infection occurred amongst the cattle on the farms Mongenstar and Mzero, and three new centres of infection were discovered on the former; 15 head died or were destroyed. In consequence of the heavy tick infestation, which was most noticeable where the grass had not been burned last season, five-day dipping was resorted to on many farms, especially those adjoining infected centres.

QUARTER-EVIL.

Ten fresh outbreaks occurred in Gwelo district. A slight mortality was reported from several districts in Matabeleland.

ANTHRAX.

All the affected and in-contact herds in the Hartley district were vaccinated. No further mortality reported.

EPIZOOTIC LYMPHANGITIS.

An outbreak of this disease, the first for over ten years, occurred amongst the mules at the Citrus Estate, Mazoe; five infected animals were destroyed. The animal which first shewed symptoms of the disease was an old one which had been in contact with infection in 1907. No other source of infection has been suggested, but it is difficult to believe that it could have existed in a latent form for upwards of twelve years.

REDWATER AND GALL-SICKNESS.

Both these diseases have been prevalent, and a considerable number of animals succumbed. In connection with the latter, the Government Veterinary Bacteriologist reports as follows:—"A large number of deaths have been reported from anaplasmosis among cattle on and from farms where dipping has been practised for some time. It would appear that we have now arrived at the transition stage in the dipping campaign, which was foreseen, when the regular dipper and the breeder of animals of improved quality is becoming the victim of his less progressive neighbours. Those men who have bred improved stock now find that they are experiencing a heavy mortality among them and a restricted market for animals which are liable to die on exposure to tick infection. Until dipping is universal and the eradication of ticks complete, the solution of the difficulty would appear to lie in the rendering of young stock immune by inoculating them with a vaccine of such virulence that it conveys the highest degree of immunity with the least possible ill effects to the animals under treatment. Foreseeing this phase, I have selected such a vaccine, and am prepared to issue it when weather conditions become favourable."

TUBERCULOSIS.

The existence of tuberculosis in an ox exported from this Territory was reported from the municipal abattoirs, Johannesburg.

THREE-DAY SICKNESS.

A few cases of this disease (ephemeral fever of cattle) were reported.

IMPORTATIONS.

From Union of South Africa:—Bulls, 4; heifers, 6; horses, 5; mules, 12; sheep and goats, 1,966.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 542; *via* Liebig's Drift, 54. To Northern Rhodesia:—Horse, 1; mules, 4; sheep, 150; pigs, 20. To Portuguese East Africa:—For slaughter purposes, cattle, 154; sheep, 80; for breeding purposes, bulls, 10; heifers and cows, 217.

February, 1919.

AFRICAN COAST FEVER.

Victoria District.—The District Veterinary Surgeon reports a great improvement amongst the cattle in the district; they are remarkably free from ticks now, especially on those farms where dipping at five-day intervals has been practised.

Melsetter.—A fresh outbreak occurred on the farm Nooitgedacht, the original centre of infection in 1914. Until the present, no case of disease has been recorded on the farm since May, 1915. Two suspected cases occurred on the adjoining farm Morgensen, but microscopic examinations proved negative. On the farm Grasslands, in the northern section of the district, several head of cattle died, and in one case the microscopical examination left practically no doubt that Coast Fever was the cause.

QUARTER-EVIL.

The existence of this disease at several centres in the Charter district was reported.

CALF DISEASE.

The Government Veterinary Bacteriologist reports as follows:—"A calf disease characterised by high fever, sweating, extreme heat of body surface, discharge from eyes, nose and mouth, congestion of visible mucous membranes, and frequently by subsequent shedding of the hair and sloughing of skin, has been reported from many districts. It has been diagnosed by stock-owners as redwater or gall-sickness, but careful examination of blood smears from typical cases has failed to reveal any parasite. On the 16th instant blood was taken from a typical case and was inoculated two hours after into a month-old calf and a year-old steer. These animals were born at the laboratory, and have been under observation since birth; they are not known to have suffered from disease at any time. No re-action has been observed as the result of the inoculation, but they are still under careful observation. The calf from which the blood was taken died the following day."

SCREW WORM IN CATTLE.

Numerous reports were received from the Salisbury and Mazoe districts as to the damage caused by this parasite. A full description of the fly which causes it appeared in the *Agricultural Journal* for December last, under the heading, "A Form of Myiasis in Cattle." So far, the most satisfactory treatment practised is as follows:—Cast the animal and arrange that the wound is uppermost; with a large spoon remove all the matter which has accumulated and distribute 15 to 20 drops of carbon bi-sulphide throughout the cavity. The animal should be held in position for a few minutes to ensure the continued action of the bi-sulphide; the wound and surrounding skin should then be dressed with a fly-repellent, for which a mixture of Stockholm tar and iodoform has been found most satisfactory. The wound could, with advantage, be plugged with tow or cotton wool, which should be removed the following day. Early attention and daily dressing are required to ensure satisfactory results. The fly lays its eggs in any open wound; these hatch out in a few hours, and the larvæ or screw worms immediately begin to burrow into the flesh. There is some reason to believe, however, that a wound is not necessary for the parasite to gain a footing, that it will hatch out in blood, such as results from the bursting of a tick, and that the worm can burrow through the skin. The fly also breeds in dead animals, and all carcases should therefore be buried deeply or burned. As a preventive, the fly-repellent referred to should be applied to all recent wounds or sores.

J. M. SINCLAIR,

Chief Veterinary Surgeon.

Farming Calendar.

April.

BEE-KEEPING.

Where numbers of the bee-louse are seen attaching themselves to the legs of bees and also among the quilts which cover the frames, this pest can be controlled by crushing them with the finger. In the cooler districts, crates that are partially filled with honey should be removed, and into the lift which they occupied plenty of warm clothing should be snugly packed.

CITRUS FRUITS.

During the early part of this month autumn budding can still be performed if sap is still up; in fact, if the season is late this operation is better done a little late than early, as in the event of late rains occurring, followed by a warm spell, the buds are liable to start growing, but are soon checked, the result of which is usually a stunted tree. Water by irrigation should be supplied to bearing orchards, unless unusual soaking rains have fallen late in season, followed by thorough cultivation and hoeing around trees. Continual watch must still be maintained for fruit-eating and codling moths. Spraying or fumigating against insect or other pests should not be neglected. Some early varieties may be expected to be ripening towards the end of this month.

CROPS.

The rains are practically over by this month, and the harvesting of early crops, such as buckwheat, linseed, teff grass and manna, will commence. The silo pit should be got ready, and the making of ensilage should be undertaken during this month. Napier's fodder can now be cut for this purpose. Veld hay for feeding should not be cut later than the end of this month. All lands that are available should be ploughed. The preparation of vleis for winter crops should be continued, and late crops, such as Algerian oats, should be sown this month; also barley for an early green crop.

DAIRY.

The milking kraal at this season of the year is generally far from clean, on account of the rain. By cows getting covered in mud from the kraal, and the mud drying and subsequently being rubbed off during the process of milking, the milk becomes highly contaminated with numerous species of bacteria. These bacteria, or germs, are the cause of nearly all the trouble in butter and cheese making which arises at this period of the year, *i.e.*, during the wet season. To prevent the same, cows should be milked in a dry place, and free from dust. If the udders are found to be dirty just previous to milking, then the milker should clean the affected parts, as the udder, flanks, etc., with a cloth which has been wrung out in clean cold water—the udder should not be washed. The milker's hands should also be washed after each cow is milked. This all spells labour to certain people, but means all the difference between the production of first grade cream and third grade, or a saleable cheese and a non-saleable cheese. In the cheese-curing room, dampness is often prevalent during the wet season, with the result that the cheeses are often covered with green and white

mould. This cannot altogether be prevented unless a properly constructed room is available, therefore wipe each cheese with a cloth every day, and the shelves should be scrubbed once a week with hot water to which a handful of washing soda has been added, and when dry should again be washed with water to which has been added a few crystals of permanganate of potash. The cheeses may also be wiped with a cloth dipped in the same water.

DECIDUOUS FRUITS.

Orders should be given to the nurseryman for trees required in August, September or October. Trees will be lifted in August, and may with advantage be kept in cool storage till required.

ENTOMOLOGICAL.

Maize.—"Earworms" are sometimes troublesome in the tassels and ends of the cobs, but this pest cannot be directly attacked. Caterpillars may attack the crop, on account of their food being suddenly destroyed by late cultivation after the weeds have been allowed to get too far ahead.

Tobacco.—Any remaining plants shewing stem borer attack should be removed and burnt.

Potatoes.—Should be systematically cultivated and hilled, to keep tuber moth from tubers.

Cabbage Family.—Plants of this family are liable to suffer severely from cabbage louse and Bagrada bug.

Beans and Cowpeas.—Insect attack on these plants is but little obvious during April.

Dhal.—Suffers much from blister beetles destroying the blossom during April. Hand picking is the only remedy.

Citrus Trees.—Collect and destroy infested fruit, to keep down citrus codling.

FLOWER GARDEN.

Sow sweet peas. Hardy annuals, such as candytuft, cornflower, eschscholtzia, gypsophilla, larkspur, mignonette, poppy, etc., may be sown in the open ground, and should not be transplanted. Perennials may be sown in boxes.

FORESTRY.

Prick out into tins the young trees raised from the seed sown in February. Any breaking up left over from last month should be completed this month; also any fire lines left unploughed.

POULTRY.

This is the first hatching month of the breeding season. Those who want their future pullets to commence laying at the beginning of the autumn should have some chicks out this month. Don't over-feed the chicks; make them take as much scratching exercise right from the start as possible by putting all grain in fine litter. Undoubtedly the best and strongest birds are reared from the start on grain, dry food and plenty of green food, especially onion tops; never forget grit, charcoal, clean water and thick separated milk. See that the breeding birds are kept in the best of health, strong and vigorous. Upon this will depend largely the success or failure of your future stock; and above all do not allow them to get fat.

STOCK.

Cattle.—Cattle on the ranch should require little attention beyond dipping. Bulls should be kept out of the herd if January calves are not

desired. Dairy cattle will require a ration of crushed or ground maize and some succulent food, such as green maize stalks, Napier's fodder or ensilage, if any of the latter has been left over from last year. Calves should be supplied with green fodder and a ration of maize meal, together with some more nitrogenous food, such as bean meal, pea meal, buckwheat meal, or linseed meal. Care should be taken to provide supplementary food to all cattle before they lose any appreciable amount of flesh, in order that mid-winter may not find them in poor condition. All preparations for making ensilage should be completed by the beginning of the month. Any haymaking still undone should be attended to without delay, weather permitting. Attention should be given to water supplies for winter, and arrangements made to prevent water holes, etc., being trodden in as the supply shortens.

Sheep.—If grass seeds are troublesome, an area should be mown for grazing. Sheep should not be allowed to graze in the vleis. If the ram is put in now, lambs will be born in September, which may be considered somewhat early by some breeders.

TOBACCO.

Curing will be continued during the month. Care must be taken to yellow the leaf well before drying out. All bales of cured tobacco should be carefully examined weekly, to ascertain the keeping condition of the leaf. Seed heads should be removed when the pods are brown and stored in a cool dry room. Lands should be ploughed and harrowed as soon as all tobacco has been removed.

VEGETABLE GARDEN.

Potatoes require ridging and tomatoes staking and tying up. Potatoes which mature after the rains may generally remain in the soil and be lifted as required. Vegetables planted out for winter crops should be well and continuously cultivated, which will bring them along quicker, with less watering. Beans and peas should be staked and tied. Beans, carrots, cabbage, cauliflower, peas, turnip, spinach, beet and radish should be sown for late winter crops.

VETERINARY.

Horse-sickness will be prevalent this month, as will blue tongue in sheep. The first symptom is laminitis, the second a protruding blue tongue.

WEATHER.

Along the higher ridges of the country we may still look for an inch of rain, more or less, during the month, though little, if any, can be expected in the Zambesi and Limpopo valleys and all low-lying parts of the country. As often as not, however, April is a dry month. In past years it has occasionally happened that early frosts have been recorded which put an end to the tobacco harvest, and may kill tender vegetables and flowers; but, as a rule, no such calamity need yet be expected, and if at all, only in frosty hollows.

May.

BEE-KEEPING.

The scarce supply of nectar, due to conditions of drought, will be responsible for a deficiency of stores. Where this is noticed, steps must at once be taken to supply the bees with artificial food in the shape of syrup. A feeder must be placed above the frames inside the hive. Never feed bees outside, as it promotes robbing.

CITRUS FRUITS.

Continue irrigating bearing orchards up to within three weeks of picking fruit, followed by cultivation and hand hoeing. The same remarks as in April apply concerning insect pests, etc. Washington Navel oranges will be ripening this month, and possibly some early ripening seedlings.

CROPS.

Crops such as summer wheat will be ready for harvesting. Majorda melons should be carted to some convenient spot, but not heaped. Ploughing should be continued on all available lands. Winter crops in vleis, such as Early Gluyas and other wheats, New Zealand oats and barley, should all be sown not later than this month. Napier's fodder may still be cut for ensilage during this month. This will give time for a considerable after-growth, which can serve as winter pasture.

DAIRY.

(See April.)

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family are liable to suffer greatly from cabbage louse and Bagrada bug during May. For the former, spray with soap and tobacco wash, which may help if the plants are not too big.

Dhal.—Blister beetles are still injurious to the blossom of the crop, and should be regularly collected and destroyed.

Citrus Trees.—Continue to collect and destroy all fruits infested with citrus codling.

Guava.—Fruit fly and citrus codling breed in these fruits during the autumn and winter.

FLOWER GARDEN.

Sow *in situ* cornflower, larkspur, mignonette, poppy; sweet peas may also be planted.

FORESTRY.

Complete pricking out into tins. Strike cuttings of species that are propagated in this manner, such as poplars. If it is intended to use the saltpetre method of eradicating stumps, the trees should be felled this month.

POULTRY.

Bring the chicks along without any set backs; keep them busy, keep them contented, and above all free from insects. The April hatched chicks during this month (that is those of the light breeds) will begin to shew their sexes; separate as soon as discernible the cockerels from the pullets. Both will come along much better if so separated. If hens are being used for hatching, see that they have comfortable nests in cool quiet places, and are kept perfectly clean and free from insects. Failure in these very necessary measures is responsible for almost all bad hatches, at any rate 95 per cent. of them. If incubators are being used, adhere to the following most important rule: Turn last on the eighteenth day, cool last on the nineteenth, then shut the drawer and don't open it again till the evening of the twenty-first, or, better still, the morning of the twenty-second. Opening the drawer frequently while the eggs are hatching is responsible for more bad hatches, dead in shell and weak chicks than many poultry keepers realise. It is infinitely better to have a couple of buckets of *hot* water standing near the incubator, round which the steam will circulate, just previous to and during hatching, than sprinkling the eggs or placing on them damp flannel.

STOCK.

Cattle.—Ranching cattle may still be expected to be in good condition. Dairy cattle should be treated much the same as is recommended for April, but the ration should be increased somewhat, especially the succulent portion. Grass may still be cut for bedding, and both cows and calves should be well bedded down at night from now onwards. Maize will probably be in fit state for making into ensilage, and towards the end of the month maize hay may be made after the removal of the cobs. The vines of monkey nuts when reaped should be carefully preserved for fodder. Cowsheds should be put in good repair against the cold winter nights.

Sheep.—The vleis having dried, sheep will probably do better in the lower lying lands. If the ram is put in now, lambs will be born in October, which is usually a good month to arrange for. Those who favour winter lambs, and have ewes lambing now, will find a few handfuls of maize a great help to the ewes in providing milk.

TOBACCO.

Curing should be finished as early in the month as possible, to prevent loss from frost. The bales of cured tobacco should be examined weekly until sent to the warehouse. Tobacco seed should be shelled as soon as the seed pods are dry, and the seed carefully labelled and stored. All tobacco lands should be ploughed and harrowed.

VEGETABLE GARDEN.

Sow broad beans, peas, lettuce, spinach, parsnips, carrots, radish and beet. Constant cultivation is necessary.

VETERINARY.

Horse-sickness will still be in evidence, and may be expected to continue until the frosts occur. Inoculation for blue tongue should be performed in the dry season only, unless the animals can be kept under cover for 21 days. Do not inoculate ewes in lamb on account of abortion. Inoculated animals spread the disease for 21 days. Scab is a poverty winter disease.

WEATHER.

The dry season should have now set in, though averages of from a quarter of an inch to three-quarters are indicated in the official reports. Ground frosts at night have been recorded, but are very unusual.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY.

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1919	January	6·46	0·40	0·03	0·21
1919	February	5·73	0·53	0·07	0·20

TEMPERATURES.

Station	January		February	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	83·5	51·8	82·6	51·0
Hartley—				
Franceys Farm	82·2	62·3	82·9	59·3
Gatooma	83·9	63·7	83·7	63·4
Hartley Gaol	86·5	58·7	87·3	58·2
Lomagundi—				
Eldorado Mine	—	—	—	—
Sinoia	84·0	67·8	84·6	72·8
Sipolilo	81·4	46·9	81·6	46·2
Mazoe—				
Mazoe Dam	82·9	52·0	81·7	49·4
Shamva Mine	69·9	66·2	67·8	65·2
Melsetter—				
Melsetter	77·9	60·1	74·9	58·1
Mount Selinda	82·3	64·1	—	—
Vermont	81·1	64·4	78·5	62·8
Salisbury—				
Botanical Experiment Station...	78·4	60·3	76·5	59·9
Chishawasha	80·3	62·7	79·0	61·3
Salisbury Gaol	79·6	60·8	78·2	58·3
Umtali—				
Public School	—	—	—	—
Victoria—				
Eythorne	91·0	61·6	85·5	59·1
Morgenster	—	—	—	—
Victoria	80·8	64·7	79·5	62·0

TEMPERATURES—*(Continued)*.

Station	January Mean Max.	January Mean Min.	February Mean Max.	February Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	80·4	63·8	78·8	62·3
Garth	88·3	64·6	80·1	62·9
Plumtree School	—	—	81·0	60·5
Riverbank	84·8	63·6	84·8	61·8
Retreat	88·8	64·4	88·3	61·6
Bulawayo—				
Observatory	79·8	62·0	77·7	59·9
Gwanda—				
Antelope Mine	83·9	69·0	81·7	64·8
Mazunga	91·4	68·2	—	—
Tuli	97·3	86·0	94·0	76·5
Gwelo—				
Gwelo Gaol	80·5	58·0	80·2	55·6
Matobo—				
Holly's Hope	84·6	64·8	82·5	63·0
Rhodes Matopo Park ...	83·6	62 0	80·7	59·4
Umzingwane—				
Essexvale	83·3	63·9	79·3	61·4
Hope Fountain	80·0	62·3	—	—
Wankie—				
Guyo	83·2	64·0	83·7	63·2
Victoria Falls	87·8	66·6	—	—
Wankie Hospital	90·2	67·7	—	—

RAINFALL.

Station	January	February	Seasonal to date.
MASHONALAND—			
Charter—			
Buhera	13·36	6·77	30·15
Bushy Park	12·87	4·65	25·52
Enkeldoorn Gaol	10·97	4·39	25·04
Marshbrook	9 83	4·43	24·89
Range	11·62	7·76	29·30
Riversdale	13·11	5·29	33·06
Umniati	16·20	5·10	27·95
Vrede	—	4·43	—
Wylde Grove	11·70	4·51	24·53
Chibi—			
Chibi	7·59	6·96	19·60
Lundy River	4·76	5·71	16·63
M'Rumi	6·98	7·43	19·80
Nuanetsi Ranche	7·99	4·26	16·07
Chilimanzi—			
Central Estates	11·78	7·77	30·14
Chilimanzi	7·07	6·12	19·28

RAINFALL—(*Continued*).

Station	January	February	Seasonal to date.
MASHONALAND—(Continued)			
Chilimanzi—continued			
Driefontein	10·69	4·45	23·36
Felixburg	8·29	5·11	—
Induna Farm	14·53	7·62	30·24
Orton's Drift	9·46	—	—
Umvuma (Railway)	16·73	6·07	33·00
Darwin—			
Mount Darwin	11·22	14·07	35·04
Gutu—			
Chingombe	—	—	—
Eagle's Nest Ranche	9·24	8·52	27·73
Gokomere	9·78	4·19	22·73
Gutu	11·57	7·44	29·10
M'vimvi Ranche	10·86	6·91	—
Noeldale	7·84	—	—
Hartley—			
Ardgowan	12 37	4·06	25·12
Battlefields (Railway) ...	10·42	9·71	28·73
Beatrice (B.S.A.P.)	11·27	6·32	—
Carnock Farm	11·27	—	—
Cringleford	11·37	5·60	33·55
Elvington	13·65	7·88	32·61
Franceys Farm	13·37	6·80	34·59
Gadzema (Railway)	11·14	5 12	32·01
Gatooma	13·24	6·12	31·13
Gatooma (Railway)	13·09	4·65	29·42
Gowerlands	9·80	5·46	24·75
Hallingbury	12·83	7·16	33·39
Hartley Gaol	15·25	5·66	34·44
Hartley (Railway)	14·44	5·33	34·71
Hopewell	12·23	4·52	—
Jenkinstown	—	—	—
Makwiro (Railway)	12·40	6·87	38·56
Ranwick	10·67	3·10	28·18
Shagari (Chevy Chase) ...	8·93	5·72	23·94
Spitzkop	—	—	—
Inyanga—			
Inyanga	18·45	—	—
Inyanga Settlement	10·53	—	—
Rhodes Estate	19·87	11·74	42·03
St. Trias' Hill	10·84	12·32	39·16
Lomagundi—			
Argyle	11·18	6·17	31·32
Banket Junction (Railway) ...	11·79	7·88	31·68
Darwendale	10·31	7·95	28·86
Duxbury Farm	12·34	5·64	25·47
Eldorado Mine	8·65	7·76	—
Eldorado (Railway)	8·65	—	—
Gambusi (Mukore)	15·65	8·33	36·64
Lone Cow Estate	12 91	—	—
Longmead	10·92	7·19	26·51
Maningwa	9·43	—	—
Mukwe River Ranche... ...	11·60	8·93	30·97
Palm Tree Farm	11·62	6·50	24·05

RAINFALL—(*Continued*).

Station	January	February	Seasonal to date.
MASHONALAND—(Continued)			
Lomagundi—continued			
Sinoia	9·83	7·08	27·41
Sinoia (Railway)	8·89	6·23	24·18
Sipolilo	10·60	10·40	30·20
Umvukwe Ranche	12·07	—	—
Makoni—			
Carlow Farm	10·21	6·75	26·45
Chimbi Source	11·89	5·83	32·17
Craigendoran	8·16	6·93	33·27
Delta	14·22	9·44	23·31
Eagle's Nest Ranche	13·99	4·44	31·44
Forest Hill	13·59	7·96	37·21
Gorubi Springs	12·92	6·51	35·06
Headlands (Railway)	7·03	3·56	21·91
Mona	11·70	6·52	30·86
Monte Cassino Mission ...	25·78	10·98	49·07
Odzi (Railway)	—	9·10	—
Rusape	11·42	5·61	27·60
Rusape (Railway)	—	6·70	—
Springs	10·39	10·63	34·51
York Farm	17·25	13·54	45·85
Marandellas—			
Bonongwe...	12·57	6·32	29·87
Huish Estate	13·07	7·61	31·39
Land Settlement Farm ...	16·49	8·57	37·61
Macheke (Railway)	14·28	9·59	36·85
Marandellas	11·65	7·73	38·97
Marandellas (Railway) ...	10·36	7·85	37·24
Nelson	12·61	7·20	30·33
Selous Nek	14·95	4·54	32·33
Theydon Farm	—	—	—
Tweedjan	13·86	5·28	27·23
Verdoy	—	—	—
Mazoe—			
Avonduur	15·42	8·84	37·69
Bindura	12·55	10·79	38·34
Bindura (Railway)	11·72	10·48	37·54
Ceres	17·10	9·97	38·88
Chipoli	12·77	10·89	39·13
Citrus Estate	11·06	7·33	31·60
Concession (Railway)	10·85	9·05	33·50
Craigengower	14·04	—	—
Dunmaglas	—	—	—
Glendale (Railway)	15·32	10·12	36·74
Kilmer	13·19	9·31	34·66
Kingston	9·76	11·46	34·90
Laguaha	12·05	8·64	31·75
Lowdale	13·90	—	—
Mazoe	—	—	—
Mazoe Dam	15·78	9·45	39·65
Mguta Valley	—	—	—
Omeath	11·92	8·69	29·22
Ruia	13·94	11·69	38·84
Ruoko Ranche	7·47	6·60	27·44

RAINFALL *(Continued)*.

Station	January	February	Seasonal to date.
MASHONALAND—(Continued)			
Mazoe—continued			
Shamva	15·37	13·85	46·66
,, Mine	12·47	13·13	39·96
Stanley Kop	9·53	11·83	31·56
Sunnyside	10·16	14·87	37·74
Teign	13·54	11·43	42·16
Virginia	13·39	8·12	32·67
Volynia Ranche	13·37	7·44	36·06
Melsetter—			
Brackenburg	14·53	7·99	38·53
Chikore	9·11	10·20	32·04
Chipinga	7·36	10·16	31·85
Helvetia	9·08	12·09	45·80
Melsetter	1·41	8·35	21·95
Mount Selinda	12·86	—	—
Mutambara Mission	10·92	4·86	25·88
Pasture	7·74	2·74	—
Tom's Hope	13·93	12·64	44·52
Vermont	11·62	14·81	46·47
Mrewa—			
Glen Somerset	15·19	6·26	30·50
Mrewa	13·68	—	—
Mtoko—			
Makaha	15·20	10·86	36·71
Mtoko	12·13	6·51	30·00
Ndanga—			
Bikita	14·04	14·40	43·04
Chiredzi Ranche	—	—	—
Marah Ranche	6·14	7·51	—
Ndanga	11·66	6·19	28·58
Salisbury—			
Ardbennie	9·84	6·44	29·86
Avondale	12·69	6·54	34·22
Borrowdale (Hatcliffe) ...	12·73	9·00	30·92
Botanical Experiment Station ...	17·19	6·00	—
Bromley	12·73	9·60	36·20
Brookmead	11·62	10·12	41·39
Chishawasha	10·15	9·08	33·81
Cleveland Reservoir ...	11·62	6·67	30·62
Ewanrigg	15·19	7·83	38·30
Forest Nursery	11·91	—	—
Glenara	13·95	7·04	35·21
Goromonzi	14·55	10·81	45·46
Gwebi	13·34	—	—
Hillside	11·19	7·32	29·84
Lilfordia	13·77	—	—
Meadows (The)	13·15	7·76	39·31
Salisbury (Gaol)	12·74	8·38	34·41
,, (Railway)	11·41	7·23	31·10
Sebastopol	9·33	7·39	31·19
Selby	11·46	8·17	33·44
Stapleford	16·82	9·67	48·21
Sunnyside	15·37	8·57	37·21
Vainona	11·84	9·53	34·20
Westridge	11·94	7·93	34·74

RAINFALL (*Continued*).

Station	January	February	Seasonal to date.
MASHONALAND—(Continued)			
Umtali—			
Chiconga	8·40	—	—
Hoboken	23·88	—	—
Muromo Ranche	6·32	—	—
Odzani	16·93	—	—
Penhalonga	9·09	15·92	32·99
Premier Estate	11·92	6·59	30·82
Public School	—	—	—
Sarum	10·37	9·90	33·70
Stapleford	25·42	26·02	73·21
St. Augustine's Mission ...	18·46	—	—
Stralsrund	10·41	8·46	27·90
Umtali (Railway)	14·30	8·94	33·70
Utopia	9·15	5·81	26·88
Victoria—			
Brucehame	6·93	3·97	19·96
Clipsham	6·53	4·48	22·27
Empress Mine	6 82	—	—
Eythorne	8·79	4·49	23·30
Fort Victoria (Railway) ...	5·43	4·15	15·83
Jichidza Mission	10·61	5·63	31·43
Makorsi River Ranche ...	7·11	6·41	23·94
Morgenster Mission	10·38	7·72	30·29
Silver Oaks	5·33	4·96	16·76
Summerton	9·03	—	—
Victoria	5·83	3·45	15·28
MATABELELAND :			
Belingwe—			
Bickwell	7·04	4·41	17·43
Tamba	7·50	4·40	16·81
Wedza	9·25	6·57	21·15
Bubi—			
Bembesi (Railway)	11·90	5·12	23·22
Imbesu Kraal	15·66	6·32	27·96
Inyati	18·71	4·39	30·85
Maxim Hill	—	4·30	—
Shangani Estates	10·55	6·10	23·13
Bulalima-Mangwe—			
Empandeni	14·67	8·92	31·43
Figtree	11·22	2·94	20·86
Garth	17·11	7·25	29·15
Holdstock	12·32	—	—
Maholi	25·21	7·85	38·36
Plumtree Public School ...	11·99	6·02	26·24
Retreat	12·07	3·76	21·95
Riverbank Farm	12·15	4·46	22·40
Solusi Mission	15·05	4·59	27·31
Tjompanie	13·34	5·76	27·38
Tjankwa	14·47	5·06	—

RAINFALL (*Continued*).

Station	January	February	Seasonal to date.
MATABELELAND—(Continued)			
Bulawayo—			
Keendale	9·68	3·68	18·41
Khami	10·14	3·74	22·15
Lower Rangemore	14·56	3·18	25·59
Observatory	8·20	5·32	23·32
Raylton (Railway)	9·80	4·86	22·36
Saw Mills (Railway)	12·12	6·14	24·66
Umgusa	9·38	—	—
Gwanda—			
Antelope Mine	10·44	6·21	24·64
Gwanda (Gaol)	11·05	4·21	21·16
Gwanda (Railway)	10·01	4·15	19·86
Lamulas	12·01	2·71	18·72
Langalanga	9·98	4·81	20·51
Mahalali	8·25	5·11	16·14
Manantji	6·61	1·94	—
Mazunga	4·36	—	—
Mapande	11·24	7·68	22·22
Mrandas	18·82	4·95	26·96
Mtshabezi Mission	5·73	7·59	17·82
Mwanezi	12·07	3·15	18·24
Sovelele	8·85	8·90	23·21
Tuli	7·18	4·13	16·71
West Nicholson (Railway) ...	8·77	4·88	23 85
Gwelo—			
Daisyfield	10·47	4·61	22·41
Dawn	15·24	6·19	31·52
Globe and Phœnix Mine ...	15·80	6·76	29·78
Globe and Phœnix (Railway) ...	12·58	5·75	25·09
Gwelo (Gaol)	13·55	2·76	27·68
Gwelo (Railway)	12·35	4·68	27·45
Hunter's Road	13·53	6·16	26·96
Lalapanzi (Railway)	12·59	—	—
Lovers' Walk	14·42	4·37	27·41
Lower Gwelo	11·98	4·28	22·52
Oaklands	14·41	11·25	32·04
Rhodesdale Ranche	12·77	4·55	25·40
Rio	14·19	9·87	29 96
Riverdale	13·50	6·10	—
Sikombela Farm	14 20	9·41	29·16
Woodendhove	—	—	—
Insiza—			
Albany	7·41	—	—
Filabusi	10·26	4·35	19·97
Fort Rixon	13·18	3·89	24·35
Infiningwe	13·10	5·51	24·19
Insiza (Railway)	11 06	5·24	23·38
Inyezi Farm	8·34	6·56	18·92
Orangedale	11·56	6 97	27·87
Roodeheuvel	11·52	7·76	27·83
Shangani (Railway)	8·76	5·65	23·53
Thornville	8·31	4·59	21·99
Matobo—			
Holly's Hope	17·10	6·34	31·31
Matopo Mission	12·02	5·91	24·99
Rhodes Matopo Park ...	11·30	6·43	27·57

RAINFALL *(Continued).*

Station	January	February	Seasonal to date.
MATABELELAND—(Continued)			
Nyamandhlovu—			
Edwalemi	13·88	5·49	25·44
Impondemi	7·88	—	—
Melinakanda Junction ...	9·63	—	—
Naseby Farm	11·99	4·11	22·81
Nyamandhlovu (Railway) ...	12·85	7·00	24·91
Sebungwe—			
Gokwe	13·63	10·10	31·89
Inyoka	13·64	6·65	—
Selukwe—			
Hillingdon	15·17	9·60	32·88
Selukwe (Railway)	15·13	10·20	37·13
Umzingwane—			
Balla Balla (Railway) ...	10·37	8·20	23·95
Crombie's Hotel	11·81	5·74	24·24
Essexvale	13·40	6·76	26·03
Heany Junction (Railway) ...	16·80	4·07	—
Hope Fountain	10·90	—	—
Ntabenende	18·32	6·55	33·57
Springs Farm	13·18	6·22	27·16
Wankie—			
Dett (Railway)	—	—	—
Guyo	12·95	8·80	26·97
Lynwood Estate	9·59	7·31	27·98
Matetsi (Railway)	10·72	8·60	25·85
Ngamo (Railway)	11·94	6·91	24·11
Victoria Falls	13·85	—	—
Victoria Falls (Railway) ..	14·83	10·44	34·74
Wankie Hospital	8·24	—	—
Wankie (Railway)	6·60	8·66	—

— No return.

Name of Association	Place of Meeting	Secretary	1919 April	1919 May	1919 June
Beatrice Road	Various farmhouses	A. V. Johnson	..	..	..
Bembesi	Queen's Mine Hotel	V. C. Andrews	4	2	6
Bindura	Bindura	G. Askew	12	10	14
Bromley	Bromley	C. J. Shirley	3	1	5
Charter—Mgezi	Beatrice Mine	W. Krienke	30	28	25
Central	Umvuma	W. A. James	26	31	28
Eastern Border (South Melsetter)	Helvetia	———	11	9	13
Enterprise	Arcturus Hotel	R. Philip	2	7	4
Felixburg—Gutu	Felixburg	R. H. Brown	..	10	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	5	..	7
Gatooma	Gatooma	T. J. Golding	19	17	21
Gazaland	Chipinga	J. Myers	..	15	..
Greystone	Various farm houses, Shangani	M. Kerr	12	10	14
Hartley	Hartley	W. M. Leggate	Friday	before full	moon
Headlands	Headland	J. Grewar	26	..	28
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	12	10	14
Insiza—Shangani	Shangani	M. E. Weale	..	..	7
Inyanga	Farm Cheshire	F. W. Thiel	26	31	28
Inyazura	Inyazura	A. C. Curling	16	21	18
Iron Mine Hill	Iron Mine Hill	T. Irving	12	10	14
Lalapansi	Lalapansi	B. J. Ingle	19	17	21
Lomagundi	Sinoia	A. H. Layard	Saturday	nearest full	moon
Macheke	Macheke	J. Cheyne	No	fixed dates	
Makwiro	Makwiro	D. M. Syme	18	16	20
Marandellas, Northern	Marandellas Farmers' Hall	A. Nicholson	5	3	7
Marandellas, Southern	Inoro	J. Gibberd	2	7	4
Makoni North	Makoni	J. G. Monckton	26	31	28
Makoni	Rusape	C. C. Tapson	12	10	14
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	2	7	4
Mashonaland, Northern Section	Various	T. H. Newmarch	No	fixed dates	
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed dates	
Matopo Branch, R.L. and F.A.	Sibali	———	..	14	..
Mazoe	Glendale Siding	A. G. McCall	9	14	11
Melsetter (North)	Various farms	N. N. Rutherfurd	..	..	7
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	11	9	13
Northern Umtali	Farm Summerfield	R. O. H. Blurton	..	..	7
Norton and District	Norton Store	C. P. Watermeyer	5	3	7
Que Que	Que Que	E. J. Ross	19	17	21
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	25	30	27
Shamva	Shamva	R. C. Frith	..	21	..
Selukwe	Selukwe	F. S. Clark	No	fixed dates	
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	10	..
Umvukwe	Various ranches	M. Mitton	12	17	14
Umtali	Christmas Pass Hotel	J. S. Holland	5	3	7
Victoria	Victoria	———	4	2	6
Victoria Midlands	———	E. F. Robertson	..	..	..
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	12	10	14

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc. ; and generally on all questions relating to live stock and to tillage operations.

The Dairy Industry

The services of a dairy expert, Mr. J. B. Fisher, N.D.D., are now available to the public for consultation, advice and instruction. Enquiries should be addressed to him direct at the Department of Agriculture, Salisbury. Addresses and demonstrations may be arranged, and as a guide to farmers' associations or other bodies desiring lectures, the following subjects are mentioned as being suitable for this purpose, although any cognate subject specially desired can be dealt with :—

1. The care of milk from the cow to the dairy.
2. Cream separators and their use.
3. Butter-making on the farm.
4. Milk and cream testing.
5. Hard cheese-making: cheddar, etc.
6. Sweet milk cheese-making: Gouda, etc.
7. Soft cheese-making: cream, cottage, Gervais, etc.
8. Preparation of cream for sale to butter factories.
9. Curing of bacon and ham on the farm.
10. The milk record of a herd.

The Poultry Industry

A poultry instructor, Mr. A. Little, having now been added to the staff of the Department of Agriculture, farmers' associations, individual

farmers and poultry keepers are invited to communicate with him direct on all matters relating to the subject. Personal visits where desired will be arranged, and lectures can be delivered on various aspects of the subject. For the guidance of those interested, the following subjects are indicated as suitable, but other matters can, if desired, also be dealt with :—

1. Selection of stock.
2. Housing and runs.
3. Incubation: natural and artificial.
4. Brooder management and care of hen and chicks.
5. Growing stock.
6. Rearing on a large scale; systems.
7. Killing and marketing.
8. Production of eggs, testing, preserving, marketing.
9. Farm poultry.
10. Breeds for utility and exhibition.
11. Selection and mating; records.
12. Standards and judging; points.
13. Diseases; treatment and prevention.
14. Internal and external parasites; prevention and extermination.
15. The foods of the country and how to utilise them.
16. *Post-mortem*, with explanations.

Progressive courses of instruction can also be arranged.

The Tobacco Industry

The appointment has recently been made of an officer, Mr. W. H. Taylor, as tobacco and cotton expert.

Advice upon all matters appertaining to culture, curing and marketing of tobacco will be furnished on application to him, and he will be also available to visit farms, attend meetings and deliver addresses on the subject.

The possibilities of cotton growing demand attention, and Mr. Taylor will undertake investigation of this question. All interested in this subject also are invited to communicate with him at the Department of Agriculture, Salisbury.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 61. Requirements in sending Botanical Specimens to the Department for Identification.

No. 62. Services of Agricultural Engineer.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.

No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.

No. 90. Reports on Experiments—Experimental Station, Salisbury, 1910-1911, by J. H. Hampton.

No. 94. Second Report on Experiments, by J. H. Hampton.

No. 134. Plans and Specifications for Flue Curing Tobacco Barns.

No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.

No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.

No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultura Engineer.

No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.

No. 177. Notes on the Raising of Seedling Trees, by F. B. Willoughby.

No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.

No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.

No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W. M. Watt.

No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.

No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.

No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 217. Windbreaks and Hedges, by F. B. Willoughby.

No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.

No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.

No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.

No. 222. Costs of Farm Operations, Gwebi.

No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.

No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.

No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.

No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.

No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.

No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.

No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 257. Maize Grading, by J. A. T. Walters, B.A.

No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 260. Rhodesian Farm Orchard, by A. G. Turner.

No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.

No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.

No. 269. Farming in Granite Country, by R. C. Simmons.

No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.

No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.

No. 296. Citrus Nursery Work, by A. G. Turner.

No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.

No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.

No. 305. Manure Supplies, by E. V. Flack.

Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.

No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.

No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.

No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.

No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.

No. 179. Buckwheat, by H. G. Mundy, F.L.S.

No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.

No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.

No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.

No. 194. Rye, by J. A. T. Walters, B.A.

No. 199. Eucalypts for the Farm, by J. J. Boocock.

No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.

No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

No. 232. Witch-Weed or Rooi-Bloem, by J. A. T. Walters, B.A.

No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 65. Common Ailments of the Horse, by D. R. Chatterley, M.R.C.V.S.
No. 95. Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.
No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.
No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.
No. 312. Anthrax, by C. R. Edmonds, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.

LIVE STOCK.

No. 145. Prospects for Importation of Cattle from Australia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 190. The Principle of the Winter Feeding of Dairy Càttle, by R. C. Simmons.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 205. Home Butter Making, by R. C. Simmons.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 282. Management of Dipping Tanks, by J. M. Sinclair, M.R.C.V.S.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms. by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 299. Grading, Classifying and Mating Poultry, by Arthur Little.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 314. Tampan or Poultry Tick, by A. Little.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 157. Hints on Brickmaking, by G. T. Dyke.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 226. Classification of Clouds.
No. 237. The Analysis of Agricultural Products, Soils, Water, etc.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 266. Directory of Farmers. (Price 1s.)
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Game Law: Summary of.
Terms for Analysis by the Department of Agriculture, of Produce, Soils, Water, etc

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HANDBOOK OF TOBACCO CULTURE for Planters in Southern Rhodesia. Sold by the Department of Agriculture. 2/6.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal.* This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 43 of 1919.] [31st January, 1919.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to amend 1 (a) of Government Notice No. 24 of 1919 by substituting the farm Rookwood for the farm Woodstock.

No. 61 of 1919.] [14th February, 1919.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to amend Government Notice No. 99 of 1918, and declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area in lieu thereof :—

MAZOE NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Burnleigh and Bamboo Creek.

(b) *Guard Area.*

An area bounded by and including the farms Arundel, Avilion, Bonny, The Vale, Hereford, Woodlands, Ceres, Murgwi, Zombi, Chewarika, Rutherdale, Maxton, Willard, Didsbury, Lone Star Reserve No. 1 and the Chiwaridza Reserve.

AFRICAN COAST FEVER: VICTORIA DISTRICT.

UNDER the provisions of Government Notice No. 412 of 1918, it is hereby directed that all cattle on the following reserves and farms shall, for a period of three months from date hereof, be dipped at intervals of not more than five days in an aqueous solution containing not less than the equivalent of .16 per cent. of arsenious oxide.

1. The following farms in the Victoria native district :—Mtilikwe Reserve, Retreat, Mlinya Reserve, Oatlands, Victoria Reserve, Le Rhone, Sikato, Tentergate, Longdale, Bombst, Kelvingrove, Marthadale, Chevedin, Histonhurst, Msali, Midrivers, Elandskop, Lothian, Dromore, Victoria Ranche, Clipsham, Flesk, Townlands.

2. The following farms in the Ndanga native district :—Cleveland, Rurgwe and Lemonfontein.

3. That portion of the Chikwanda Reserve lying east of the Msari River, in the Gutu native district.

J. M. SINCLAIR,
Controller of Stock.

7th February, 1919.

No. 110 of 1919.] [21st March, 1919.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 344 of 1918, declaring an area of infection in Salisbury native district.

CATTLE CLEANSING ORDINANCE, 1918.

IT is hereby notified that the "Champion" Arsenical Cattle Dip in the dilution of one gallon of dip to 300 gallons of water conforms to the standard strength laid down by the "Cattle Cleansing Ordinance, 1918."

J. M. SINCLAIR,
Controller of Stock.

15th January, 1919.

No. 102 of 1919.] [14th March, 1919.

IMPORTATION OF CATTLE.

HIS Honour the Administrator has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," notwithstanding any general restriction on the importation of cattle and the provisions of Government Notice No. 226 of 1918, to provide that the importation of cattle entered for exhibition or competition at any Agricultural Show in Southern Rhodesia may be permitted from the Cape Province, Orange Free State and Transvaal, at the discretion of the Controller of Stock.

No. 65 of 1919.] [21st February, 1919.

ABOLITION OF POUND ON FARM MAGOHLO, INSIZA.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," and at the request of the Civil Commissioner, Bulawayo, to declare and make known that the pound on the farm Magohlo, Insiza, in the magisterial district of Bulawayo, established by Government Notice No. 300 of 1909, has been abolished.

No. 86 of 1919.] [7th March, 1919.

POUND AT FELIXBURG.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Victoria, to declare and make known that the pound on the farm Haig (Fairburn), established by Government Notice No. 6 of 1918, is hereby abolished, and that, at the request of the Civil Commissioner, Charter, a pound has been established on the farm Grasslands, in the magisterial district of Charter, and that the said pound shall be available for the public from date hereof.

No. 87 of 1919.] [7th March, 1919.

CITRUS CANKER.

WHEREAS the disease known as "citrus canker" exists, or is supposed to exist, in the Union of South Africa, and whereas the introduction of the said disease into Southern Rhodesia would be prejudicial, it is hereby notified

that, under and by virtue of the powers conferred upon him by the "Importation of Plants Regulation Ordinance, 1904," His Honour the Administrator has been pleased to prohibit the introduction into Southern Rhodesia from the Union of South Africa of any citrus trees or parts thereof, including fruit, seed, seedling trees, cuttings, branches, leaves and budwood.

No. 62 of 1919.] [14th February, 1919.

EUROPEAN FOUL BROOD.

IT is hereby notified that His Honour the Administrator has been pleased to approve of the cancellation of Government Notice No. 442 of 22nd November, 1918, which prohibited or restricted the importation into Southern Rhodesia from the Cape Province of the Union of South Africa of honey, bees, beeswax, foundation comb, used beehives, or used beehive accessories.

No. 53 of 1919.] [7th February, 1919.

APPLICATIONS FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
R. S. Newett	Mazoe	Mazoe	Farm Avonduur
J. T. L. Bekker	Odzani	Umtali	,, Odzani Junction

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications, together with a full statement of the grounds for such objections.

No. 66 of 1919.] [21st February, 1919.

IT is hereby notified that His Honour the Administrator has been pleased to make the following grant under the "Water Ordinance, 1913" :—

To *John Strachan,* in respect of the land known as the Willows, Lemon Pool and Mazoe Junction Plots, in the district of Mazoe, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-fourth of the public water in the Mazoe River measured at the upper boundary of the farm Willows Plot, for the irrigation of land riparian to the said river on the plots Willows, Lemon Pool and Mazoe Junction, subject to the following conditions :—

(1) That in this grant one-fourth of the public water shall mean one-fourth of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the plots Willows, Lemon Pool and Mazoe Junction, jointly in extent approximately 380 acres. On any sub-division of the land this grant shall be subject to revision in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That the grantee shall provide and erect, if called upon so to do, a suitable permanent gauge for measuring the flow of water at the head of the furrow.

Dated the second day of December, one thousand nine hundred and eighteen.

No. 67 of 1919.] [21st February, 1919.

IT is hereby notified that His Honour the Administrator has been pleased to cancel so much of Government Notice No. 450 of 1916 as refers to grants in respect of the following farms :—Cromlet, Alderley, Umritsur, The Springs, Crag, The Grove, Learig and Kilmuir, all in the district of Salisbury, and to substitute in lieu thereof the following grants, under the "Water Ordinance, 1913" :—

1. To *James Ross*, in respect of the land known as Cromlet Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of one-fifth of the normal flow of the Umtengi River measured at the point at which the river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

2. To *Harold D. Rawson*, in respect of the land known as Alderley Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of four-fifths of the normal flow of the Mabfen River measured at the point at which the river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

3. To *James Ross*, in respect of the land known as Umritsur Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of one-half of the normal flow of the Umwindsi River measured at the point at which the river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

4. To *Reginald Hartley Thackeray,* in respect of the land known as The Springs Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of four-fifths of the normal flow of the Umwindsi River measured at the point at which the river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

5. To *Ernest E. Homan,* in respect of the land known as Crag Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of one-half the normal flow of the Umwindsi River measured at the point at which the river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

6. To *Anthony Goodwyn Staunton,* in respect of the land known as The Grove Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of one-half the normal flow of the Umwindsi River measured at the point at which the river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

7. To *Glynne Albert Peacocke,* in respect of the land known as Learig Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of three-fourths of the normal flow of the Umtengi River measured at the uppermost point at which he at present diverts water for the purpose of irrigation, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

8. To *James Watson,* in respect of the land known as Kilmuir Farm, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use public water to the amount of the whole of the normal flow of the Umwindsi River measured at the point at which the

river reaches the uppermost boundary of the said farm, from the said river, for the irrigation of riparian land on the said farm.

Normal flow in this grant shall mean the amount of normal flow remaining after the rights of upper proprietors have been satisfied.

This grant is issued subject to the right of all other riparian owners on the said river to obtain the right to use and thereafter to use a reasonable share of the water in the said river for irrigation purposes.

Dated the seventeenth day of July, one thousand nine hundred and eighteen.

No. 111 of 1919.] [21st March, 1919.

APPLICATIONS FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following applications have been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
G. L. Harrington ...	Odzani	Umtali	Farm The Grange
J. B. Bray ...	Graham's Spruit	,,	,, Fairholme

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of these applications, together with a full statement of the grounds for such objections.

LEGISLATIVE COUNCIL, 1919.

Back row, from left to right : Messrs. R. G. Garvin, J. Robertson (Clerk of Councils), G. H. Eyre, E. Edwards (Parliamentary Reporter), J. D. Mackenzie, J. B. G. Hicks (Acting Assistant Clerk of Councils), M. E. Cleveland.

Second row : E. W. S. Montagu, G. Mitchell, E. A. Begbie, Dr. Eric Nobbs, L. Cripps, B. I. Collings, J. McChlery.

Front row : Col. Sir Raleigh Grey, C. H. Tredgold, H.H. the Resident Commissioner, H.H. the Ad-

THE RHODESIA

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Edited by the Director of Agriculture,

assisted by the Staff of the Agricultural Department.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

IMPERIAL PREFERENCE.—The decision of the British Government to give a tariff preference to products of the Empire is of paramount importance to South Africa and Rhodesia generally, and has been received with feelings of great gratification. The preference applies to wines, tobacco, sugar, tea and dried fruits, and although we in Rhodesia are at present only concerned with tobacco, the increased production which this concession will undoubtedly promote should indirectly benefit us here. As regards tobacco, there is a splendid opportunity for establishing our leaf on the home market, for the preference given will amount to approximately 1s. 4d. per lb. on the present tariff. This gives us a

very considerable advantage over American imports, and in view of the fact that tobacco comparing very favourably with Virginia leaf can be grown in Rhodesia, it is only reasonable to suppose that the manufacturers in the United Kingdom will be very ready to take all the leaf of a suitable quality we can send. It is not expected that there will be any leaf available for export this year, but the preference mentioned will undoubtedly lead to a considerably larger acreage being placed under tobacco next season, and consequently a certain proportion of the crop will be available for export.

Land Settlement.—This matter was discussed at the last session of the Legislative Council, and the position, as it stands at present, explained by H.H. the Administrator on behalf of the Government.

The question of land settlement comes under two heads: (1) the scheme evolved as the result of Sir Rider Haggard's mission; and (2) proposals made for the settlement on the land of returned soldiers.

In regard to the former scheme, the details of which are well known and need not be repeated, it appears that land has been passed as suitable which will accommodate 70 settlers. Three or four of these are already in the country, and between 30 and 40 approved settlers were at the time of the debate waiting passages from England.

In regard to a general land settlement scheme, as in so many deserving proposals brought before the Legislative Council of late, the matter resolves itself into one of expense. As His Honour pointed out, a very large expenditure would have to be faced in any scheme of this kind, and at the present time, with the embargo on the borrowing of money, it is impossible to procure the requisite funds. Failing the provision of money for the organisation of a large scheme, His Honour mentioned that a certain amount could be done, and was being done, to help returned soldiers to get on to the land on reasonable terms.

Tsetse Fly.—The question of the encroachment of tsetse fly southwards in the vicinity of the settlement of farmers on the Gwaai River formed the subject of a resolution brought before the Legislative Council at the recent session by Mr. Mitchell, who asked the Government to take steps, if they had not already done so, to deal with the matter. The Director of Agriculture, in explaining the measures which had been taken to prevent the spread of the fly, said that it had been decided to permit the free shooting of game, which undoubtedly was the principal host of the fly, in an area lying between the railway line and the Gwaai River. This area would serve as a general buffer to prevent the game coming southwards, and so possibly carrying disease to the farms to the south and west. This shooting without a licence will, however, only be allowed on the outer edge of the fly area. Within the fly area, operations will be conducted by an officer of police specially qualified for the task, and he will be assisted by Europeans, native hunters and such beaters as may be required. The Director of Agriculture fully endorsed the hope

expressed by the mover of the resolution that there should be no ruthless destruction of game, and sympathised with the suggestion that the Government should do all they could to preserve the game by proper game reserves in suitable localities. The Director of Agriculture further explained that experiments in bush clearing were being initiated during the present dry season, with a view to finding out whether by clearing the heavy bush and undergrowth the fly may be discouraged.

Congo Cattle Trade.—The position in regard to the restrictions prohibiting the transit of cattle for the Congo through the Territory of Northern Rhodesia was explained by H.H. the Administrator at the recent session of the Legislative Council.

It appears that the Northern Administration do not see their way to relax the regulations in regard to slaughter cattle, but there is a possibility that breeding stock may be allowed to pass through.

His Honour, in the course of his remarks, mentioned that there was some diversity of opinion, in view of the immense distance involved, as to whether it would be profitable to send slaughter cattle to the Congo. However, His Honour indicated that he would personally investigate the matter during his tour to the Congo, and if circumstances warranted it would make further representations to the Administration of Northern Rhodesia.

Stock Thefts.—This question, which has been causing a certain amount of disquietude amongst farmers in the Territory, was discussed at the last session of the Legislative Council. Mr. Cripps, who introduced the subject, said that farmers thought the reason why thefts of stock were on the increase was because the punishment did not fit the crime. The solution, Mr. Cripps suggested, was the employment of an increased and more vigilant native police force, and he also considered that the use of bloodhounds might be beneficial in tracking down the thieves.

The employment of bloodhounds for this purpose, it will be remembered, formed the subject of a resolution at the annual congress of the Rhodesia Agricultural Union in 1917, when Mr. Roberts spoke of the effective work these dogs had done in Kentucky.

The statement that thefts of stock were increasing was not endorsed by the Attorney General, who reiterated the information he had given to a deputation from the Agricultural Union that there had been a decrease of 30 per cent. last year in this form of crime, and only three thefts from white men. In regard to the question of adequacy of punishment, he instanced the sentence of two years' imprisonment and 15 lashes passed on one culprit. In subsequent remarks the Attorney General mentioned the practice of farmers employing natives to purchase cattle for them as one of the causes of stock thefts, and deplored the failure of farmers to report thefts.

It is pleasing to note that the whole question of thefts from farmers, petty thefts as well as stock thefts, is engaging the serious attention of the Government, and farmers can rest assured that suitable action will be taken.

QUARTER-EVIL.—A resolution requesting the Government to take immediate steps for the preparation in the Territory of quarter-evil vaccine was brought forward by Col. Heyman at the last session of the Legislative Council. Col. Heyman, in referring to the prevalence and spread of the disease in the Territory, emphasised the necessity of having supplies ready to hand, and asked if the vaccine had to be obtained from the Union that a guarantee be given that it would be supplied immediately it was required. The subsequent debate resolved itself into a question of the expense involved. The Director of Agriculture indicated the process of preparation of the serum, and stated that although it was quite possible to manufacture quarter-evil vaccine locally, the existing accommodation at the Veterinary Laboratory was quite inadequate for the preparation of the material, and that no funds were available to carry out the necessary extensions. The Attorney General endorsed this statement, and said he was informed by the Veterinary Department that adequate supplies of serum were at present held in Rhodesia, and, if required, further quantities could be obtained quickly.

We are now in a position to say, in amplification of the discussion in the Council, that there has been an unprecedented demand of late for the vaccine both in the Union and in Southern Rhodesia, and some difficulty has been experienced in securing adequate supplies. Orders to meet this emergency have been placed, and it is hoped that the Veterinary Department will be able to meet all demands made upon it.

TRADES COMMISSIONER FOR RHODESIA.—A matter of very considerable interest to the farming community of this Territory was introduced at the last session of the Legislative Council by Mr. Mitchell, who moved a resolution to the effect that a Trades Commissioner be appointed for the encouragement and development of trade in Rhodesian products on the Union market. This official, it was proposed, should reside in Johannesburg, and the resolution also asked for the appointment of an official in Rhodesia to circulate information to producers regarding conditions of markets overseas, in the Congo and South Africa, together with particulars of freights, railway rates and other charges. Mr. Mitchell, in introducing the resolution, drew attention to the excellent market that existed for Rhodesian products on the Rand, and he considered that, although there were difficulties in the way, by combined and determined efforts a footing could be gained there. Mr. Mitchell dealt with the subject in a very comprehensive and able manner, and in referring to the question of distance, said that although this was a drawback, he did not consider it a fatal one. Distance did not prevent tea coming from China, canned fruits from California and Tasmania, or milk from

Switzerland, the difficulties in these respects being overcome by combination and organisation. The resolution was strongly supported by the elected members of the Council and sympathetically received by the Government. The Attorney General, in replying, promised that it would receive the full consideration of the Government.

Mexican Marigold.—In the Legislative Council the subject of the Mexican marigold was raised and the proposal put forward that it might be exterminated by introducing legislation empowering noxious weeds to be proclaimed and a penalty imposed on those who allow them to exist on their land, and for Government to eradicate them at the cost of those who fail to do so for themselves. Such legislation is of very doubtful efficacy, even in a country where the density of occupation of the land renders such measures more possible than in this sparsely peopled country. A real danger lies in the false sense of security which the proclamation of a noxious weed under such a law is apt to engender, the impression being conveyed that, the Government having taken up the matter, the individual is no longer under any obligation to protect his own or his neighbour's interests. Further, it is generally found that all weeds not so proclaimed are neglected as not being officially noxious, and farmers are apt to regard the onus shifted from their shoulders to those of the Government by the simple process of demanding that a weed should be proclaimed. The process of cleansing a farm by Government employees, even at the cost of the recalcitrant owner, is always apt to be unsatisfactory. Especially is this true of an annual weed, for a warning must always be given before Government steps in, and during this time the pest is apt to shed its seed; the removal of the dried old plants from which the seed has fallen is then wasted labour.

Where such a law exists, farmers are apt to wait until warned or compelled to clean their lands, instead of doing so at the proper time of the year. It is found too that farmers will not report other farmers for not dealing with such weeds, and even an army of weed inspectors could hardly effectually deal with such a trouble in Rhodesia. Compulsion in any form is liable to be resented. In varying degrees these different causes, often small in themselves, combine to render the extirpation of weeds by legislation rather an ineffectual proceeding.

Alarming as is the spread of the Mexican marigold, especially during the last two years, it has been found possible to deal with it by the simple expedient of pulling it up when the ground is wet or of cutting it down, in either case doing so before the seed is set. This weed is a shallow-rooted annual, and therefore readily dealt with in this way, although not, it must be admitted, without the employment of some labour. In addition, the ordinary practices of good farming, persistent cultivation, summer fallowing and a rational rotation of crops, in themselves judicious measures, are helpful in keeping down Mexican marigold where it is likely to establish itself in old or improperly tended lands, for undoubtedly it spreads very rapidly through neglect, carelessness, or bad farming methods generally.

Statistics of Live Stock and Animal Produce

FOR THE YEAR 1918.

By F. EYLES, F.L.S., Statistician.

The domesticated animals fall naturally into two main classes, namely, the producers of food and the providers of labour. Members of both classes also supply materials for making clothes and for other manufacturing purposes, but at present to a very insignificant extent in Rhodesia.

The food producers are cattle, for beef and dairy products; sheep and goats, for mutton, the latter to a small extent for milk also; pigs, for pork, bacon, lard, etc.; and poultry, for eggs and for table purposes.

The providers of labour are oxen, horses, mules and donkeys, for transport and other draught purposes.

Materials for manufacture, other than food products, are hides for leather, derived from cattle; and skins, wool and mohair, derived from sheep and goats. Bones for the manufacture of fertilisers are also a not unimportant item.

The tables and diagram that accompany this article shew that some kinds of stock are advancing, others decreasing, and others again continually fluctuating as to numbers. It is not sufficient to take an absolute increase or decrease by itself and draw encouraging or depressing conclusions therefrom. For instance, a decrease in production of one kind of food may be balanced by an increase elsewhere, and the diminishing numbers of most small stock shewn in the tables may be related to the steady advance of large stock. Such correlation warrants the assumption that, as Rhodesian veld is less suitable for sheep and more suitable for cattle, the latter are a more profitable, or at least a more secure investment, so that capital tends to be attracted to cattle ranching at the expense of sheep farming.

Cattle.—The gross total of cattle owned by Europeans and natives in the Territory at 31st December, 1918, was 1,210,547 head, or an increase of 11.7 per cent. over the previous year's record. The average annual increase since December, 1914, has been at the rate of 12.8 per cent., and if this could be maintained, the cattle would rather more than double themselves every six years. But, as a matter of fact, the annual

Sheep.		Goats.	Pigs.	Poultry.
Merino.	All other.			
...	266	116	210	1,270
2	905	435	433	2,997
50	4,682	1,888	824	4,517
...	2,514	1,053	413	2,320
84	1,830	543	398	976
20	2,595	403	386	4,158
...	2,213	1,128	360	2,692
344	4,565	1,578	368	3,923
...	1,566	555	65	1,039
...	1,497	360	145	672
30	588	226	324	1,293
980	3,326	695	944	8,261
24	517	145	216	1,162
...	13	...	6	60
...	164	189	35	239
66	1,612	914	483	3,848
...	867	253	273	2,446
181	2,470	1,198	456	3,843
163	1,020	382	547	4,052
232	1,532	1,511	1,097	7,187
166	1,921	523	1,920	7,687
1	926	679	1,185	4,211
37	1,714	760	2,507	7,901
...	...	...	37	114
...	9	...	...	152
...	127	36	145	1,027
31	502	537	618	3,767
1,522	209	128	106	439
211	1,123	1,722	299	1,832
2,850	2,936	2,885	448	3,278
6,994	44,209	20,842	15,248	87,363

rate of increase exhibits a tendency to diminish and may possibly continue to fall. It can, however, be shewn that a diminishing *rate* of increase of the herds (stock-in-trade) in a country is not necessarily a bad sign, and indeed, at a certain stage of development, may have the opposite meaning and prove that business is good. For example, the simple statement that the rate of increase for cattle in 1917 was 12.8 per cent., and in 1918 only 11.7 per cent., does not reflect the true position, for it neglects the factors of purchases and sales, without accounting for which the progress of a productive industry cannot be gauged. The number of cattle slaughtered for local consumption is not available, but the numbers exported and imported are known. During 1918 there were exported 22,969 and imported 1,020 head. The difference between these two figures, added to the "stock-in-trade" at 31st December, 1918, gives a total of 1,232,496, which represents the actual growth of the herds during 1918, and proves the natural increase so far as ascertainable to have been for that year at the rate of 13.7 per cent., a figure which would be still higher if we knew the numbers slaughtered for local use. Until the country becomes fully stocked, an annual increase of the herds is necessary for the enlargement of the industry, but progress cannot be measured by that alone. When the stage of fully stocking approaches, with, it may be hoped, a growing export trade, the annual rate of increase of herds will diminish and tend to reach a point of equilibrium, and then the cattle industry will be at its maximum of prosperity so far as numbers are concerned.

In the four years ending 31st December, 1918, the net increase of all cattle amounted to 61.8 per cent. of the total at 31st December, 1914.

The cattle owned by Europeans at the end of 1918 totalled 600,447 head, as against 532,311 at the end of 1917, a rate of increase equal to 12.6 per cent. for that year.

In the four years ending 31st December, 1918, the net increase of European-owned cattle was 75.6 per cent. of the total at 31st December, 1914.

The average annual increase was at the rate of 15 per cent.

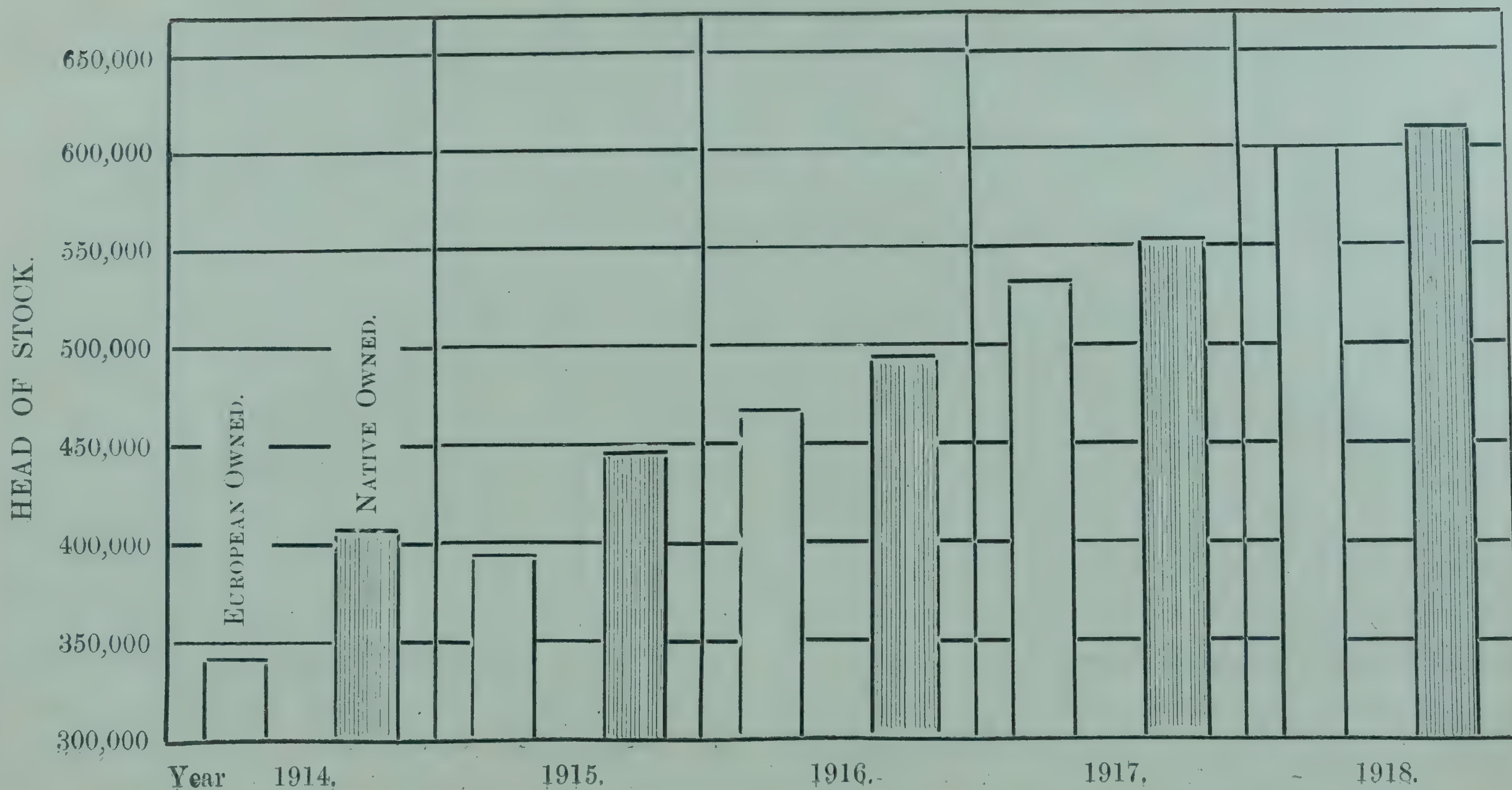
The diagram "Annual Increase of Cattle" shews that the European-owned herds are rapidly overtaking the native-owned herds, and it may be expected that at the end of 1919 the numbers will be just about equal.

Native-owned cattle at the end of 1918 totalled 610,100, an increase of 10.6 per cent. over the previous year.

In the four years ending 31st December, 1918, the net increase of native-owned cattle was 50.2 per cent., which may be compared with the figure 75.6 per cent. increase in the same period for European-owned cattle.

The average annual increase was at the rate of 10.7 per cent.

ANNUAL INCREASE OF CATTLE.



For clearness, the various increases of cattle are tabulated below:—

Increases of Cattle.

Per centum.

	European, per cent.	Native, per cent.	All Cattle, per cent.
Total increment between 31st December, 1914, and 31st December, 1918—four years	75·6	50·2	61·8
Average annual increase over four years	15·0	10·7	12·8
Net rate of increase from 31st December, 1917, to 31st December, 1918	12·6	10·6	11·7
Natural rate of increase, 1918, allowing for exports and imports, but not counting local slaughter ...	...	...	13·7

At the rates of increase of last year, the numbers of cattle in Rhodesia at the present moment, June, 1919, should be:—European-owned, 638,000; native-owned, 642,000; total, 1,280,000 head.

At the end of the present year they may be forecasted at:—European-owned, 676,000; native-owned, 675,000; and total, 1,351,000 head.

The proportion of European-owned female cattle in the country remains as in 1917, that is, 60 per cent. of the whole, a high figure due mainly to the fact that many stock-owners have only lately established their herds, or are still in course of doing so, and consequently have a preponderating number of foundation breeding stock, and, as yet, not a full complement of oxen. The number of trained oxen shews the small increase of 2,214 head as a set off against decreases in other draught animals, *i.e.*, mules and donkeys. The number of untrained oxen has increased by no less than 23,054 head, indicating that exportation is not keeping pace with production.

The proportion of bulls other than stud bulls is slightly less than before, there being 7.3 other bulls (including calves) to every stud bull, the figure for 1917 being 8 to 1. The proportion of bulls to the total male cattle remains much as before, being nearly one quarter of the whole.

The districts which head the list for cattle are Gwelo, 52,706, the first district to pass the fifty thousand mark; Victoria, 48,595; and Hartley, 45,729 head. Seven districts possess over 30,000 head of cattle each; seven between 20,000 and 30,000; and six between 10,000 and 20,000; while there are ten districts carrying less than 10,000 head of cattle.

A comparison of tables for the last two years shews a good deal of inter-district movement of cattle.

Table II. gives an analysis of the cattle returned as pure-bred, including Africanders. It has been found, however, that the returns for Africanders are as a whole less reliable than those for other breeds: many men entering their entire herds under this name, when it is known that the animals do not all conform to the type. Therefore, for the purposes of comparison, only the breeds of European origin will be considered. If the Africanders are deducted from the 1917 total of pure breeds, we get 3,694 as the figure for that year. For 1918 the total of European pure breeds is 5,280, an increase of nearly 43 per cent. The greatest rise in actual numbers is in the Shorthorns, 519 animals having been added, equal to nearly 40 per cent. increase. The greatest relative increase among the first five breeds is that of Aberdeen Angus, which is 130 per cent. The other popular breeds maintain steady progress, advancing respectively as follows:—Devon, 38 per cent.; Friesland, 35 per cent.; and Hereford, 37 per cent. Sussex is practically stationary. Ayrshire, though the figures are still small, increased by 140 per cent. The other breeds number less than one hundred each.

It will be noticed from Table II. that one-third of the pure-bred bulls are "other than stud bulls," that is, not being used for breeding purposes. These are mostly young stock held for sale, and their distribution at prices lower than for imported animals will be a great advantage to the country. The term "pure-bred," as here used, does not denote stud-book animals, though these are included. It means all animals returned by their owners as being of pure descent. The growth of pure-bred herds may be regarded as highly satisfactory, especially in view of the difficulties in the way of importation under war conditions, and even more rapid advance may be anticipated when normal conditions return.

Dipping Tanks.—Recent legislation, making the dipping of cattle compulsory all over the country, has stimulated the work of building dipping tanks. At 31st December, 1917, there were 991 tanks in the country, and at 31st December, 1918, the number was 1,263. There were also 56 tanks then under construction, many of which would have been completed but for the dearth of cement. The same factor has prevented a number of other stock owners from starting work on the tanks they intend to build. The ideal of one tank for every self-contained herd has not yet been reached, but the number of tanks is now so considerable, and so rapidly increasing, that it will soon be difficult for any owner to plead that he cannot dip his cattle because no tank is accessible. It seems to be recognised that the direct advantages of the practice far outweigh any possible indirect disadvantages, and dipping to-day is more general than ever before, in fact nearly universal.

Sheep.—Next in importance to cattle as food producers are sheep. After shewing an upward tendency in the two previous years, so that the hope was expressed that Rhodesia would shortly become self-supporting as to the supply of mutton, the flocks were reduced in 1918 by no less than 13,914 head. This disappointing result was probably in large measure due to the unusual amount of rain in two consecutive seasons, always unfavourable to sheep. It is true that some thousands of sheep were exported, but this does not account for the depletion of the flocks.

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for the importations were three times greater than the exports. It may be argued that this is essentially a cattle country, the veld being as yet, for the most part, unsuited to sheep, and that it will pay Rhodesia to sell beef and buy mutton. On the other hand, if we can raise our own mutton, so much to the good, and it has been proved that some districts of the country can carry good flocks of healthy sheep. More than that, locally grown mutton is declared to be of better quality than that from the south, and it is fairly certain the farmers will not be beaten in their attempts to supply local markets with local sheep.

Goats.—These continue to decline in importance so far as European flocks are concerned. Goats, as browsers, have an injurious effect on the herbage of a country side, and the presence of large flocks might be a doubtful benefit. They will probably be gradually replaced by sheep.

Pigs.—The number of these has again fallen back. It has been proved here, as elsewhere, that the pig can "pay the rent" given a fair chance. Everything depends on his being properly cared for at home and well received on the market. As previously pointed out, when grain brings good prices, it does not pay to feed pigs, and the mealie farmer finds it more profitable to sell mealies. Although shewing greater fluctuations than any other kind of stock, the pig is the only one of all the "small stock" to-day in a better position than in 1914.

Poultry.—The number of poultry and the production of eggs are less than the previous year. This may be accounted for by the excessive rains of the last two seasons, accompanied in 1918 by heavy losses of birds from disease and theft during the influenza epidemic, when poultry along with many other things on the farm were perforce neglected. It is admitted that Rhodesia is an ideal country for poultry raising, and a rapid recovery of the industry may be expected.

Draught Animals.—Oxen, already dealt with, easily hold the premier place. The fact that so high a proportion of all oxen remain untrained, indicates that the supply of working cattle at least equals the demand. Ox labour is considered the cheapest of all animal labour, and with a large surplus of it available it is hardly to be expected that farmers will put much money into mules or donkeys for draught purposes. This is the position shewn by the figures, which give over 100,000 head of untrained oxen, and at the same time mark a decrease of both mules and donkeys. In fact, both of these are for the most part kept as "stand bys" to meet special contingencies.

Horses are stationary, and will probably remain so until the horse-sickness problem has been solved.

Live Stock in General.—The following table, similar to that given last year, shews the changes in each class for the period under record. Cattle alone have advanced. Without exception, every other kind of live stock has gone backwards. Last year's comments on the general decrease of small stock are still applicable.

	1917.	1918.	Difference.
Cattle	532,311	600,447	+ 68,136
Horses	1,669	1,599	— 70
Mules	2,182	1,988	— 194
Donkeys	9,605	8,868	— 737
Sheep	65,117	51,203	— 13,914
Goats	28,299	20,842	— 7,457
Pigs	18,879	15,248	— 3,631
Poultry	101,592	87,363	— 14,229

Animal Produce.—Below is a comparative summary of the animal products sold for the two years 1917 and 1918, and the 1918 figures are given in detail in Table III.

The reduction in eggs has already been referred to under poultry. The decrease in amount of cream sold is set off by the large increase of milk sold, and the fact that the making of cheese is said to be on the increase, and now of sufficient importance to be included in the next returns.

The other items all shew progress and call for no special comment.

	1917.	1918.	Difference.
Eggs, dozs.	135,895	116,950	— 18,945
Cream, lbs.	367,240	263,452	— 103,788
Milk, lbs.	2,464,016	3,240,931	+ 776,915
Butter, lbs.	204,886	209,439	+ 4,553
Wool, lbs.	20,824	24,157	+ 3,333

Wagons.—The return of farm wagons, taken for the first time, gives the following result:—

Ox wagons	1,834
Mule wagons	213
Donkey wagons	257
	2,304

Scotch carts and mule carts, when returned, were not included, but mule "trolleys" were counted as wagons. For convenience, the wagons

are shewn in Table III., where the distribution by districts will be seen. It will be noticed that over 40 per cent. of the wagons are concentrated in the five great grain growing districts, and indeed the numbers closely correspond in ratio with the quantities of maize respectively produced, as the following comparison will shew:—

District.	No. of Wagons.	Position as Maize Producer.
Mazoe	271	1st
Salisbury	218	2nd
Hartley	186	3rd
Gwelo	160	5th
Lomagund	131	4th

The presence of mines in a district also probably influences the number of farm wagons, for farmers often do wood riding and other transport for the mines, but the necessity of carrying large quantities of grain to the railway is clearly the controlling factor.

Cotton Culture.

By H. W. Taylor, B.Agr., Tobacco and Cotton Expert.

In several parts of Southern Rhodesia experimental plots of cotton have been planted, and some of the trials indicate that this important crop can be profitably produced in this Territory. During next season it is hoped that more extended and exhaustive trial plots may be established, and the object of this article is to draw the attention of the farmers to the importance of cotton production, and to enlist their co-operation in giving the crop a practical test on economic lines.

CONDITIONS REQUIRED FOR COTTON CULTURE.—The two determining factors in cotton production are soil and climate. Of the two, the latter is more important, as cotton can be produced on a variety of soils.

Soil.—The soils which give the best yields of cotton are sandy (see plate 1) and clay loams and alluvial soils. The colour of the soil is of minor importance, but the cotton plant is greatly influenced by the texture, humus contents and drainage. Any soil to be suitable for cotton growing must be moderately fertile, well drained, and contain a fair amount of organic matter. Soils which are abnormally rich in plant food do not usually produce the highest yields, as the plants develop vegetation rather than fruit when grown on such soils. On the other hand, if the soil is poor in plant food, a profitable crop of cotton cannot be produced without the use of fertilisers or manures. The types of soil in Southern Rhodesia which appear to be best suited to cotton growing are those derived from the diorite formation and the soil on the contact between diorite and granite. Some of the deep and well-drained sandy soils are also suitable for this crop. Sandstone soils are also excellent for cotton production.

Climate.—The climatic conditions required for profitable cotton culture are as follows:—(1) A growing period of six months or more without frost; (2) a moderate, well-distributed rainfall during the growing period; (3) plenty of sunshine and little or no rainfall during the maturing period. The cotton plant requires a rather long period for full development, and is very susceptible to frost. This appears to be the deciding factor in cotton culture in Rhodesia, as the growing season is short in many parts of the Territory. In those areas where the growing period—from the first spring rains to the first killing frost—is less than six months, cotton cannot be successfully produced. In many parts of Rhodesia the rainfall is ample, as cotton can be produced with 20 to 25 inches of rainfall. Where the rainfall is less than 20 inches, it is doubtful if the crop will succeed. Throughout Rhodesia there is an abundance of sunshine during the latter part of the growing season, which is a condition required for successful cotton cultivation.

METHOD OF CULTURE.—*Preparation of the Soil.*—The soil for cotton growing should be well prepared. The best time for breaking is during the winter, and the soil should be brought into good tilth after the first spring rains. The cotton plant is very tender and delicate when it first appears above the surface of the soil, and the land intended for the production of this crop should therefore be well prepared, in order that the young plants may have every advantage as regards soil moisture and plant food during the early stages of growth. Ploughing should be as deep as the surface soil will permit. Care should, however, be taken to see that the implements do not bring to the surface a large amount of sub-soil. It is better to plough slightly too shallow than too deep.

Planting.—Cotton should be planted as soon as possible after the first spring rains. If the rains are late, it may be well to plant the seed in the dry soil, in order that germination may take place as soon as possible. The only danger in planting in dry soil is that the first rain

Plate 1. Field of cotton. Alderley Farm, Enterprise district. Grown by Mr. H. D. Rawson on sandy loam soil.

Plate 2. Ratooned cotton, second year. Grown at Experiment Farm, Salisbury, on red diorite soil.

may be somewhat in advance of the regular rainfall, and only sufficient to cause germination. In that case, the young plants would perish and replanting would be necessary. Planting can be done either by hand or with a planter, but the latter method is advised where possible. Cotton planters are so constructed that they will also plant maize, but the ordinary maize planter will not plant cotton. The rows are placed 3 feet apart, and the seeds are planted thickly in the rows, to ensure a perfect stand. The planter should be so adjusted that the seed will be placed in the soil to a depth of about one inch. If planted too deeply, the young plants will not be able to reach the surface of the soil. About 20 lbs. of seed are required per acre.

Cultivation.—As soon as the plants are up sufficiently to follow the rows, cultivation should be commenced. No fixed number of cultural operations can be laid down, but cultivation should be frequent enough to keep the surface of the soil in a finely pulverised condition and the crop free from weeds and grass. The early cultivation should be fairly deep, to aerate and warm the soil, but later cultivation should be shallow, in order that the lateral roots may not be injured. Hand cultivation is necessary to remove the weeds and grass growing in the row between the cotton plants. When the plants begin flowering, inter-tillage with implements should cease, but if weeds spring up later, they must be removed by hand hoeing.

Thinning.—When the cotton plants are about 6 inches in height, they should be thinned to stand from 8 to 10 inches apart in the rows. Close spacing in the rows prevents an abnormal development of wood and foliage, and induces early development. In thinning, the strong vigorous plants should be left and the weak plants removed.

Picking.—When about one-third of the bolls have opened, picking should be started. In picking, only the seed cotton should be removed, and care should be taken to prevent dry leaves, portions of bolls or other foreign substances from being mixed with the cotton, as "trashy" cotton is of lower value. The seed cotton should be dry when picked, but if moist from dew or from light showers, it should be allowed to dry in the sun before being stored. Ordinary grain bags can be used as receptacles when picking. A reim or strong cord is fastened to either side of the mouth of the bag, and then slung over the neck and one shoulder. The mouth of the bag is held open by a wire hoop, so that both hands of the picker are left free. Natives are rather slow in the beginning, but can be easily taught so that they will pick sufficient cotton to pay their hire. They should be instructed to grasp each lock of the boll at the same time, and to remove the cotton with a quick movement of the hand. The seed cotton should be stored in grain bags or wood packs until the whole of the crop has been picked, when it is sent to the gin to be prepared for market.

Ratooning.—On account of the short growing season in some parts of Rhodesia, it will probably be best to allow the cotton plants to stand for two or more seasons (see plate 2). The plants begin growing in the second year before the rains start, and thus have the advantage of a longer period of growth. In parts of the Transvaal this system of culture has resulted in greatly increased yields. The plants should not

be pruned until growth begins in the spring of the second year. The dead wood can then be pruned away above the point where the young growth appears. The field should then be well cultivated as though planting had been done during the same season.

VALUE OF COTTON CULTURE TO RHODESIAN FARMERS.—At the present time there are only two field crops being produced on a large scale in Rhodesia. On account of the different soil and climatic requirements of these two crops and the difference in the amount of labour required per acre, they cannot generally be used in rotation. It is thought that cotton may be a crop which can be adapted to a rotation which will be of much benefit in conserving the fertility of the soil. Farmers also require a crop which is not exhaustive of soil fertility. The following table will shew the amounts of plant food removed from the soil by tobacco, maize and cotton:—

Plant Foods removed from the Soil by Crops.

Crop.	Nitrogen.	Phosphates.	Potash.	Total.
Cotton—	lbs.	lbs.	lbs.	lbs.
300 lbs. lint	1.02	0.30	1.37	—
650 lbs. seed	20.34	10.67	7.84	—
	21.36	10.97	9.21	41.54
Maize—				
8¾ bags	32.14	12.36	7.06	—
4,000 lbs. stover	41.60	11.60	56.00	—
	73.74	23.96	63.06	160.76
Tobacco—				
1,000 lbs. leaf ...	44.00	5.00	52.00	—
353 lbs. stalks ...	12.00	2.00	17.00	—
	56.00	7.00	69.00	132.00

From the above it will be noted that a crop of maize removes about four times as much plant food from the soil as a crop of cotton, and a crop of tobacco more than three times as much. Cotton when prepared for market is not a perishable product, and can be stored for a long period of time without deterioration. It is therefore suitable for export, and there is an almost unlimited market for cotton overseas. It is also a profitable crop when grown under favourable conditions of soil and climate, and can be made the source of a large additional revenue to the farming community.

COLONIAL COTTON AS AN ASSET TO THE EMPIRE.—The cotton industry in Great Britain has been built up to tremendous proportions. It has been estimated that about £500,000,000 is engaged in or directly dependent on the cotton trade, and that no less than 10,000,000 of the population are directly or indirectly dependent on this trade for their daily bread.* This immense industry has been built up on raw material

*Bulletin No. 64. British Cotton Growing Association.

imported from overseas, and principally from the United States of America. The extent to which the cotton industry in Great Britain is dependent on American raw material is shewn by the following figures :—

Five Years' Trade—Raw Cotton—1909-13.†

(Annual Average.)

From	Imports. Value.
United States of America	£48,200,000
British Empire	2,326,000

Not only is the cotton trade in Great Britain largely dependent on supplies of raw cotton from the United States of America, but it is doubtful if an ample supply will always be available. In the first place, the United States of America is steadily increasing her cotton manufacturing, so that less raw cotton is available, and secondly, the cost of production is increasing so rapidly that cotton growing will not pay unless very high prices are obtained.

Cost of Cotton Production in the United States of America :—†

Approximate cost	in	1914—8 cents (4d.) per lb.
,,	,,	1915—12 cents (6d.) per lb.
,,	,,	1916—18 cents (9d.) per lb.
,,	,,	1917—20 cents (10d.) per lb.
,,	,,	1918—23 cents (11½d.) per lb.

Should the supply of raw cotton from the United States of America be cut off from Great Britain on account of any unforeseen difficulty, the cotton trade of the British Empire would be paralysed, unless new fields could be developed. It is, therefore, of the greatest importance to the Empire that new cotton fields be developed, in order that a supply of raw cotton is assured, and if possible these new fields should be located in British Colonies.

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†*The Textile Mercury*, 15th March, 1919.

Bacon Curing on the Farm.

By Jas. B. Fisher, N.D.D.

Owing to an ever-increasing demand for advice from farmers and small holders in regard to bacon and ham curing, the following article, written by the above whilst in the service of the Union of South Africa, is herewith published for the benefit of those interested in the subject.

Skill in bacon curing can only be obtained by practice. The farmer who practises bacon curing should also know something of the breeding, feeding and killing of pigs, and although pig raising is not strictly speaking a part of this article, it seems advisable to mention something of this portion of the industry. In the first place it is impossible to turn out the best bacon from an ordinary "kaffir" pig, otherwise bacon factories and butchers would not pay enhanced prices for the so-called better grade of hogs. The pig which is to furnish the style, form and substance of the side of bacon now most in demand must not only be bred on different lines, but the system of feeding which has generally been in vogue up to the present time must be improved for the production of that carcase of pork which, when converted into bacon, will command the highest market prices.

The kind of pig kept throughout the country—except in a few instances—is well enough known with its razor-like back and legs like a race-horse. The animal is allowed to roam about on the veld, running all its fat off and becoming entirely useless for the purpose of manufacturing bacon. The taste of the public in Rhodesia does not vary so much as in other countries, but it may be taken that, on the whole, the bacon most in demand seems to be that with the medium fat, the so-called "streaky" bacon. To produce this kind of bacon, it is necessary to observe three points:—

(1) The breed of the pig.
(2) The feeding of the pig.
(3) The weight and age of the pig at the time of killing.

The Breed Recommended.—There seems to exist considerable difference of opinion as to the type of pig generally most profitable. Payment at the factory is usually made according to quality. What this means to the country can be readily understood, as this difference in price is really a bonus to the producer of the best bacon. This system of classifying the bacon is good, as it thus indirectly improves the whole industry of the country. The Large Black and the Berkshire are well known, and in some districts Tamworths are also kept. Each breed has its own good points. A popular cross is that between the Berkshire boar and

Large Black sow. Owing to the scarcity of Tamworth sows the crosses between them and the Berkshire boars are not to be found in great numbers. This cross is to be strongly recommended.

It is unfortunate that the Large White Yorkshire is not so well suited as the black breeds to the conditions of this country, for it excels as a bacon pig. The pure-bred Large Black is said by some bacon curers to produce bacon coarse in texture; on the other hand, it has proved itself to be a thrifty breed and well suited to the conditions of the country, and, crossed with the Berkshire, a good bacon pig is produced.

Fig. 1 shews the difference between a cut of bacon from a Large Black compared with that from a Berkshire. A cross between the two would give an ideal mixture or "streaky" bacon.

Fattening.—The majority of pigs are produced on the farm, and in farm-curing heavier animals may be utilised as well as pigs of the size most acceptable at the bacon factory. The average weight of a bacon pig is about 200 lbs. live weight. The farmer's pig, however, might with advantage be a good deal heavier than that, but should not be over fat.

The pig which is to be sold as a bacon pig or a porker should be well fed, and growth should be pushed from start to finish. It is too often the case that young pigs are allowed to grow into "stores," and afterwards they have to be fattened off at a considerable loss. The animal is more or less starved for about twelve months, after which it is put up to be fattened for a period of two or three months. It thus consumes an enormous quantity of food, much of which is required to enable the pig to regain that flesh which it ought never to have lost, and which might have been retained at a fraction of the cost of renewal had the animal been judiciously fed from the beginning. The resultant pig is an immense animal, strong in bone, coarse in hide and several inches thick in fat on the back and ribs. The bacon pig should reach a suitable weight for killing at seven to nine months old.

Pigs constitute a big source of revenue to the dairy farmer, and especially to the cheese maker in utilising the whey. It has been reckoned that a farmer can keep one pig to every cow where cheese is being made. Pigs should be specially finished off for a few weeks before slaughtering. The excessive feeding of mealie meal tends to produce a soft, greasy fat. and barley or pea meal should be added for the purpose of hardening the flesh. Barley meal is one of the best foods for pigs, when obtainable at a reasonable price. A few pounds of oats may be fed with advantage daily during the last three weeks or so before slaughter.

Bacon and Ham Curing.

Previous to being slaughtered the animals should never be overdriven or heated, and they should be fasted for twelve hours before killing, during which period they should have access to water to prevent cruelty. The reason for curing meat is that flesh of all kinds is subject to decomposition; it is therefore necessary that some method of preservation should be adopted to preserve the soundness of the meat pending its use as a food. The salting of the meat in the first place causes deterioration in its quality by the extraction of a large part of the

juices from the flesh, and the real skill of the bacon curer is shewn in preserving the meat with a minimum loss of the nourishing juices, so that the consumer will not only be supplied with the meat in a wholesome and palatable condition, but also in a form containing the greatest amount of value as a food.

As already stated, the farmer's bacon pig should weigh something over 200 lbs. live weight. An average pig weighing 224 lbs. alive will give 168 lbs. of dressed carcase, that is, after the primary offal has been removed, the carcase consisting then of the body with the head, feet and flake lard. Slaughtering should be done in the winter months, and on as cold an evening as possible, the cold night air being of great benefit in cooling and hardening the carcase. The place selected should be free from flies, dust and odours. It is advisable in this hot climate—and especially in parts where the winter is not very cold—to cut the pig down the centre of the back when killed and cleaned, and to take out the backbone at once. In this condition the cooling is much more rapid than if the whole carcase is hung up by itself.

The Equipment.

The tools necessary for farm bacon curing are not many in number, and should consist of the following:—

(1) A common rope pulley-block.
(2) A sticking knife about 10 inches long.
(3) A 10-inch shop knife, with rounded point, for cutting up the meat.
(4) A back saw with 20-inch blade is indispensable.
(5) Pig scraper, or an ordinary spoon.
(6) Salinometer for testing the strength of the brine or pickle.
(7) A chopper is useful, although not absolutely necessary.
(8) Gambrels made of galvanized iron; a simpler one than that in the accompanying figure will do.
(9) Pickle pump or syringe.
(10) A meat testing thermometer to test the temperature of the meat is used, although not absolutely necessary so long as the temperature of the room is known.
(11) Sieve to distribute the salt, etc., on the meat, but this can be done as well by hand.
(12) Pickling tub.
(13) Spring balance to weigh up to 250 lbs.
(14) Steel.
(15) Ham and bacon trier (very useful). By inserting it into the cured meat and smelling it after withdrawal, it will be easy to tell if the meat is tainted or not. After withdrawal always close up the opening made with the finger.

In addition to these tools it will be necessary to have some good method of heating water. Every farm should have for general purposes a boiler, either a portable one or one built round with bricks, and heated by means of a fire underneath.

The Building.—It is important to choose as cool a place as possible for the curing process. Any outhouse which is sweet and clean, with

Plate 1. Two sides of bacon. Fig. 1, Large Black; Fig. 2, Berkshire.

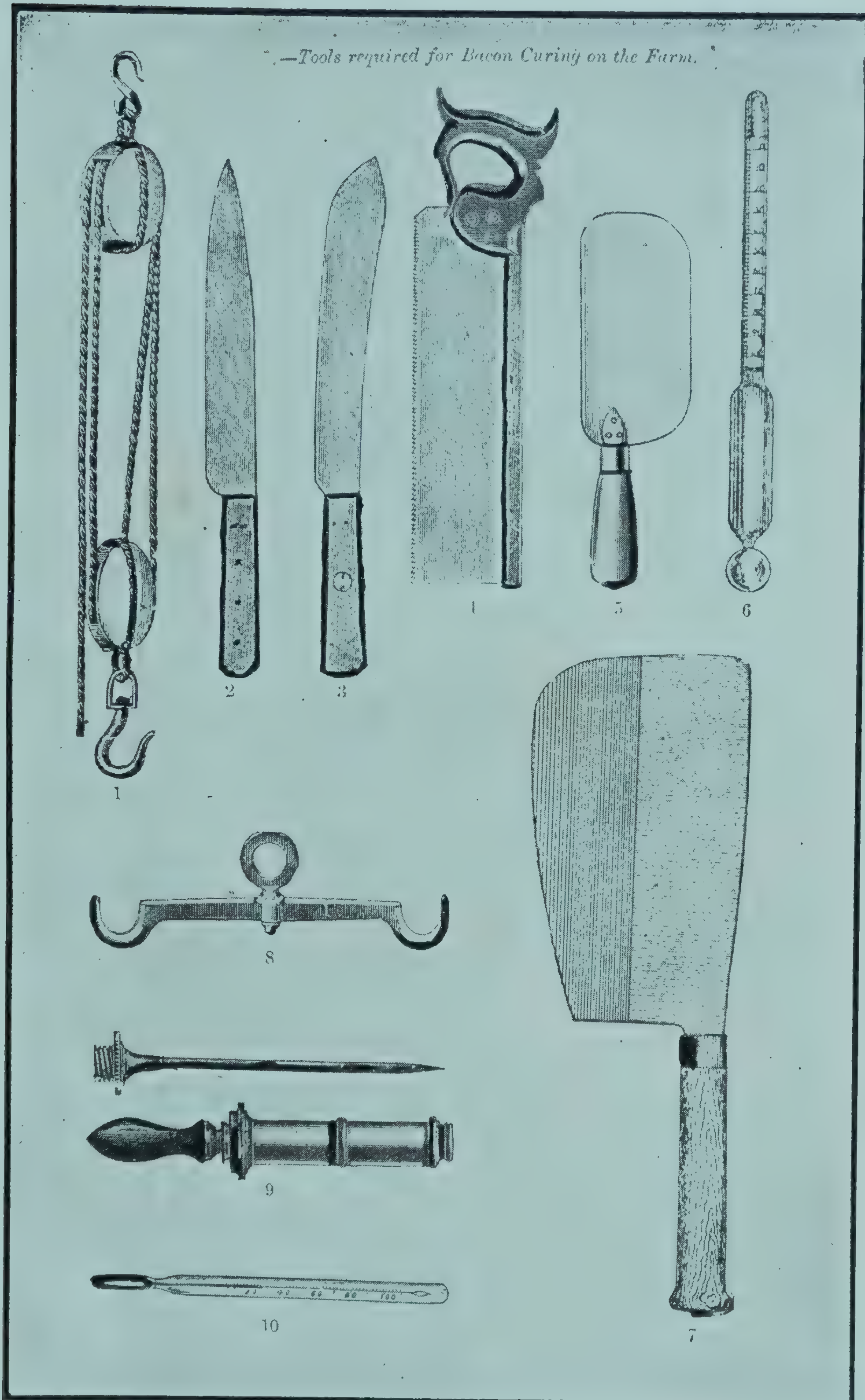

Plate 2. Implements used in the slaughtering of pigs and curing of bacon.

flagstones or cement for a floor, and which can be kept dark but well ventilated, is suitable. If such a place is not obtainable, an apparatus can be rigged up in the open air, in some place conveniently close to the hot water supply, and the carcase hung from a ladder, a branch of a tree or to a tripod formed of three poles. The curing room must be as cool as possible, and must be kept spotlessly clean, with free circulation of fresh cool air.

To farmers desirous of curing bacon and ham for sale, the following notes may be useful. The floor of the curing room or cellar should be continuous if possible, and formed of cement sloped in one direction, so that any pickle oozing out from the sides can flow off readily to a convenient point, where it is caught in a hold-all. There should be two or three tanks, each about three feet square, in the corner of the cellar. These tanks, which should be fitted with a clean sink plug at the bottom, are required for the curing of heads, feet, houghs and other odd pieces. The walls of the cellar should be quite smooth and washed over with cement, and the ceiling should be boarded over. The cellar should be furnished with a tight fitting door, made of boarding placed on either side of runners and packed in between with sawdust or cork chips. There should be no window into the cellar, but there should be ventilators at the highest point, which may be opened and shut at will. Such a curing-room could be easily constructed on a farm. In addition to the curing-room, there should be a small room set aside for the manufacture of sausages and small goods. The equipment in this place consists of a sausage machine, a sausage filler, a cooking pan, and tables, knives, etc.

Slaughtering.—As previously mentioned, a pig should be fasted for twelve hours before being killed, water only being allowed. The best and most humane way to kill a pig is first of all to stun the animal by administering a smart blow with some fairly heavy instrument between the eyes and a little above. Two attendants then turn the pig on its back, one holding the hind legs, the other the front legs, while a third person takes hold of the snout, and, holding it well back, plunges the sticking knife into the throat, severing the jugular vein, and driving home in the direction of the heart. A more convenient method is to hook the pig as soon as stunned by one of the hind legs on to the pulley or cross bar already described, and then to insert the sticking knife. In this suspended position it is obvious that all of the blood will flow out rapidly; so much so, indeed, that movement indicating life ceases in less than a minute.

Scraping the pig to remove the hair is the next step. Several methods are practised. In more up-to-date places the pig, whilst in the suspended position described, is run along on an overhead bar to the boiler, and from this lowered into the hot water registering 175 deg. to 180 deg. Fahr. The carcase is turned round in the hot water until the hair comes away in the hand. It is then hoisted on to the adjoining scuttling table, where the hair is scraped off with a knife, or, better still, some blunt instrument—the writer has found nothing superior to a kitchen spoon.

Another method, and a good one for a farm, is to lay the pig on a piece of zinc roofing on a table, cover over with a sack and apply the hot

water by means of a bucket till the hair can be rubbed off. Still another good method is to dig a slight depression in the ground, into which the pig's body—or at least the bottom side—will fit, place a sack in this and lay the carcase on top and apply the hot water.

An incision is then made on the hind legs to expose the sinews, and under these a spreader is inserted, and the carcase hung up high enough to allow the operator to work with ease. A sharp knife is now drawn from the tail, right down the middle of the belly to the tip of the jaw. The aitch bones and breast bone are now severed with the saw. The windpipe should be severed at the root of the tongue, and the whole of the entrails then removed through the severed breast bone. The carcase is now washed over with cold water. If the weather is cold enough the carcase should be hung in a cool place for 18 to 24 hours to allow it to harden and become firm before cutting up. If the weather is not cold the carcase may be split down the middle straight away, as in this state it cools more quickly.

The weight of the pig is taken from the carcase, freed from all internal portions except the flake lard or kidney fat. All the various parts of the offal are used where slaughtering is done on a large scale. The intestines, when thoroughly cleaned and salted, may be used for sausage making. The tongue, liver, kidneys, heart, etc., are best used fresh. The flake lard, along with other scrap pieces of fat, should be rendered down into lard for household use.

The carcase is now cut down, by an incision below the skin, from the root of the tail right down the vertebral column to the base of the neck; the back is then split down the centre either with a chopper, or, better still, by the use of a saw, and the head cut off. The cheeks may be separated and cured as "pig cheeks," and the rest of the head may be made into brawn. The two halves should next be laid on a table and the shoulder cut off behind the shoulder blade. The blade bone should be taken out and the feet cut off. The hams are next cut out at the third joint from the tail, and the hip bone removed. The sides are now trimmed, the ribs and the part of the backbone left being carefully removed. When removing the bones from a bacon carcase, the cavity created thereby should be sprinkled with boric acid powder.

Curing.

There are two methods of curing bacon and ham, viz., the drysalting method and by the use of brine. The former is more convenient where a small amount is handled, the latter where a large or "trade" quantity is under consideration.

Drysalting Method of Curing.—For a carcase weighing about 200 lbs. dead weight a mixture of the following may be used:—

16 lbs. salt (fine dry).
3 to 4 lbs. brown sugar.
8 to 10 ozs. saltpetre (no other chemicals being used).
1 tablespoonful mixed spice.

The sides and hams are well rubbed on both sides with this mixture, and placed in some vessel, as a zinc bath, which is tilted at a slight angle.

Plate 3. Implements used in the slaughtering of pigs and curing of bacon.

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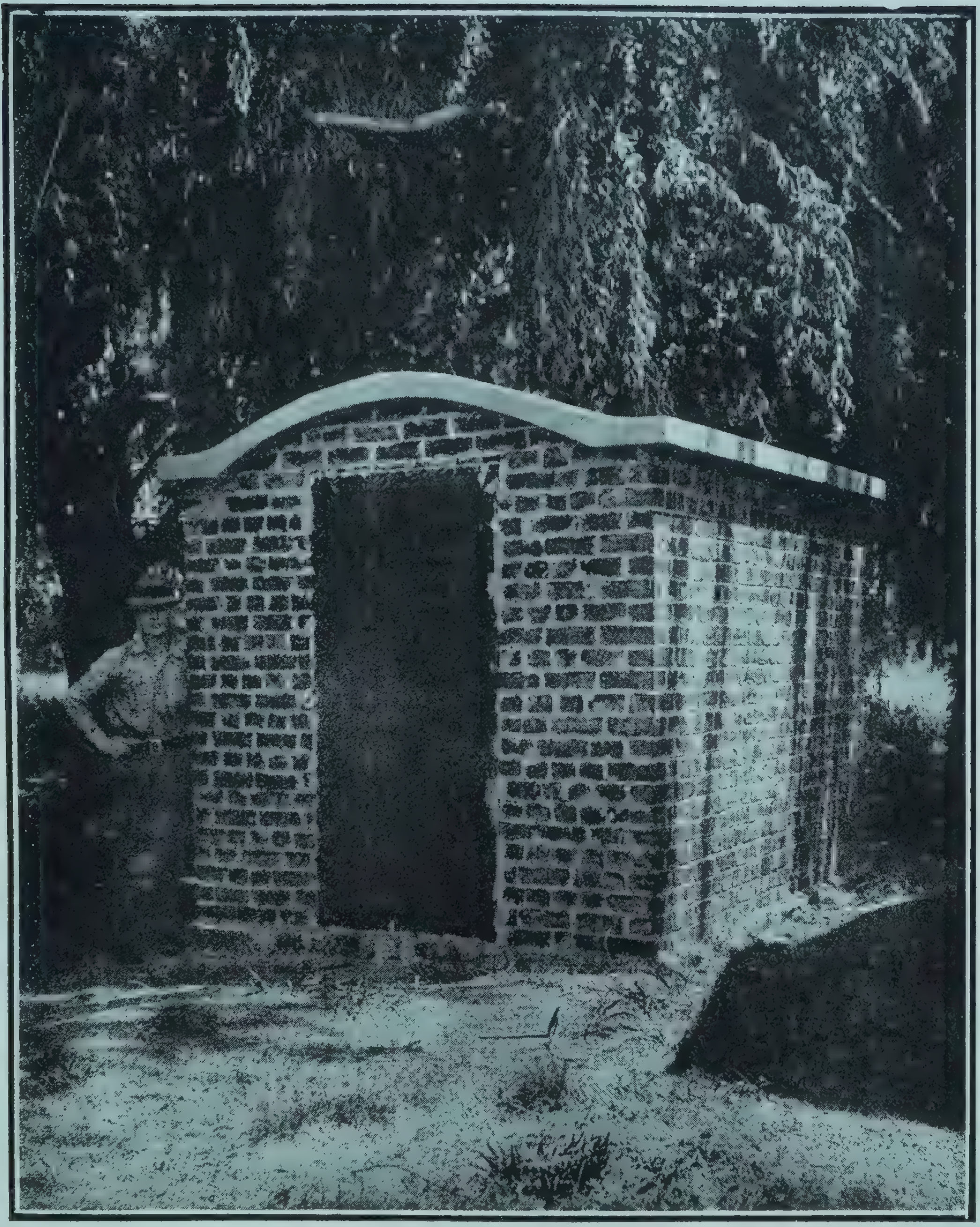


Plate 4. Style of building suitable as a smoke house on a farm.

The hams are laid one on top of the other at the lower end of the bath, and the sides at the upper end. The sides of bacon are rubbed every second day with some of the "slushy" salt and turned. As the red liquid gathers at the lower end it is ladled over the hams every third day till cured, and these also are turned each time, the top one being placed at the bottom. The sides will take about six to seven days to cure, and the hams, which include the shoulders, require about a month. A good rule to remember for the hams is this: allow three clear days, and in addition one day for every pound weight, *i.e.*, if a leg weighs 28 lbs., it should be in the salt for 31 days. After curing, the hams and sides are taken out, washed and dried with a coarse cloth, then air dried. After this they may be either smoked or sewn up in muslin bags of double thickness, and hung and stored in some cool, dry place away from flies.

Graduated Salting.—If it is the case that more than one pig is being turned into bacon, then what is known as a "graduated salting" may be given, as follows:—The first side to be used to receive four to five days' salting, the second side six to eight days, the third side eight to ten days, the rest ten to eleven days, always having regard to the length of time each piece has to be kept in the household; the one which received four to five days' salting to be used first of all. The sides should now be numbered and stored away.

Second Method of Curing by Pickling.—Different bacon-curers have recipes of their own, but a mixture which answers the purpose well is made up of the following:—

14 to 16 lbs. good salt.
$\frac{3}{4}$ lb. saltpetre.
3 lbs. sugar.
1 tablespoonful mixed spice.
6 ozs. boric acid.

Mix this up in five gallons of water, boil and skim till clear. This pickle should test about 100 deg. on the salinometer, or in the absence of one, a sound potato may be used, which should float in the pickle. The sides and hams are allowed to lie in this pickle for about a month or twenty-eight days. If the sides are to be mild cured, then eighteen to twenty days are sufficient. After they have been in the pickle for the allotted time, they are treated in the same manner as for drysalting.

Pickling by the Use of the Pickle Pump.—For this operation it is necessary to obtain a pickle pump or a syringe, together with a supply of pickle and a salinometer to test the same. The liquid should test 100 deg. on the salinometer, and if it does not, more salt should be added to bring it up to the right strength. In the absence of this instrument, the strength of the pickle may be gauged by using a sound potato. If it floats the liquid may be said to be about right. A good pickle may be made up as follows:—

14 lbs. salt.
$\frac{3}{4}$ lb. saltpetre.
3 lbs. sugar.
5 gallons water.

This mixture should be boiled and skimmed till clear, and should be

made on the day previous to being used, so as to be quite cold. The point of the needle is now forced into the fleshy parts of the meat and the liquid injected; especially is this required where any bones have been taken out, such as into the seat of the shoulder blade and hip bones. The sides and other pieces are now laid on a salt bed about one inch thick, the meat is sprinkled all over with a fine coating of saltpetre and on top of this a heavy layer of salt is laid. For a mild cured bacon fourteen days are sufficient, but if to be kept for some months another fourteen days will be required.

Smoking.

When curing is finished, the hams and sides are washed sufficiently to free them of all outside salt. They are then thoroughly dried with a coarse towel or cloth and hung up to air-dry. After thorough drying, they may be smoked.

Any house may be used where the outlet of smoke can be regulated. It should have a concrete floor for preference. An inexpensive building similar to the one shewn in the illustration can be built and used as a smoke house. The dimensions are: length, eight feet; width, six feet; height, seven feet. The approximate number of bricks required to erect this building is 2,200. The roof is of reinforced concrete. There should be a few bars let into the bricks near the roof from which the ham and bacon may be suspended. Such a building should have a small ventilator on the opposite side to the door near the roof. Another building having the same dimensions, but with a less expensive roof, may be erected as follows:— Instead of the reinforced concrete roof a comparatively flat roof of corrugated iron can be used. On the top of the four walls a layer of cement mortar is placed, and whilst still soft the iron is laid on top and the ends pressed into the mortar before it hardens. In order to provide support for the roof sheets, three purlins should be built into the walls at the roof-level; one at mid-length of the building and the other two close against the end walls. These purlins should be fixed by strips of hoop-iron, having one end nailed to the purlin and the other end built into the brickwork of the walls. In order to make the roof air-tight strips of asbestos sheeting should be put between the sheets where the edges overlap and verandah connection screws used to draw the edges together.

One or preferably two paraffin tins, into which holes are punched on the sides and bottom and containing red hot ashes and a good layer of some hardwood sawdust on the top, are put on the floor. The door should be closed and the sawdust allowed to smoulder. Smoking generally occupies three to four days. The sawdust sometimes smothers the fire, and a good plan to prevent this is to mix some dry oak leaves or other non-smelling leaves with it.

If it is found too expensive to build a smoke house, a hole in the ground may be used, particularly where only a small quantity of meat is cured. A hole should be dug some six feet deep in which the smoking apparatus is arranged; over this a large size packing case is placed, and from the inside of the case—by means of a bar run through it—the bacon and hams are hung.

Smoking helps to cure the meat as well as to add flavour to it. The meat should finally be powdered very slightly with some antiseptic, and tied up in a double cheese-cloth bag and stored away. Two good methods of storing are: first, packing away in wood ash, and second, storing in bran. The former is perhaps the better method of the two.

Boiled Gigot of Bacon or Westphalia Pork.—Take a middle of good pork, lay in a tub with common salt for twelve to fourteen hours, then take out and dry.

Make the following pickle:—

Water, 1 gallon.
Salt, 4 lbs.
Saltpetre, 2 ozs.
Coarse sugar, 2 ozs.
Chopped bay leaves.

Boil all this together, and when cold pour it over the pork and leave for fourteen days. Take the meat out and dry it. Hang in cool, draughty place for a few days, and smoke or not as desired.

Seed Maize.

By C. Mainwaring, Assistant Agriculturist.

There is always a shortage of good seed maize at planting time. This condition is all the more regrettable because it need not exist, and it is much more serious than commonly supposed, because many do not fully realise the tremendous loss to themselves and the Territory due to planting inferior seed. A full stand of plants may be obtained from inferior seed, but the yield will not be the best possible. The loss is due to delay or negligence, and can be prevented by the selection of seed at harvest time. Many let the opportunity pass, expecting to purchase their seed maize, only to find they cannot buy at any price when the season arrives for planting. Maize that is not fit for seed should on no account be planted. The character of the seed used is one of the most important factors in the production of a large maize crop, and especially because it is so liable to be defective. Fertile soil, good cultural methods,

protection against insects and plant diseases, are all of the utmost importance in contributing to the final results, but none of these factors can make amends for poor seed. A full stand of vigorous plants must be secured, and the only way to secure it is by using good seed. Making use of good seed is one of the cheapest and simplest ways of increasing the maize crop, but its very simplicity is a danger, since it causes many farmers to overlook its importance. The ideal way to secure good seed is to produce it at home. No maize purchased can be as well adapted to home conditions as that which may be developed on one's own farm, provided, of course, that a start is made with a good type of the kind it is intended to grow. Maize is more sensitive to change of conditions than any other crop. The man who secures a good type and then gives it careful attention year after year, planting only the best ears out of the best part of his crop, has a much better chance of success than the man who depends upon purchased seed, unless perhaps in the case when a neighbour upon whom he can always depend is giving special attention to the production of good seed.

The aim in selecting seed maize is to determine which is the best sample for seed purposes. The best seed is that which will produce the heaviest yield of grain of the best quality for feeding or for manufacture; such a type must therefore be most profitable to grow.

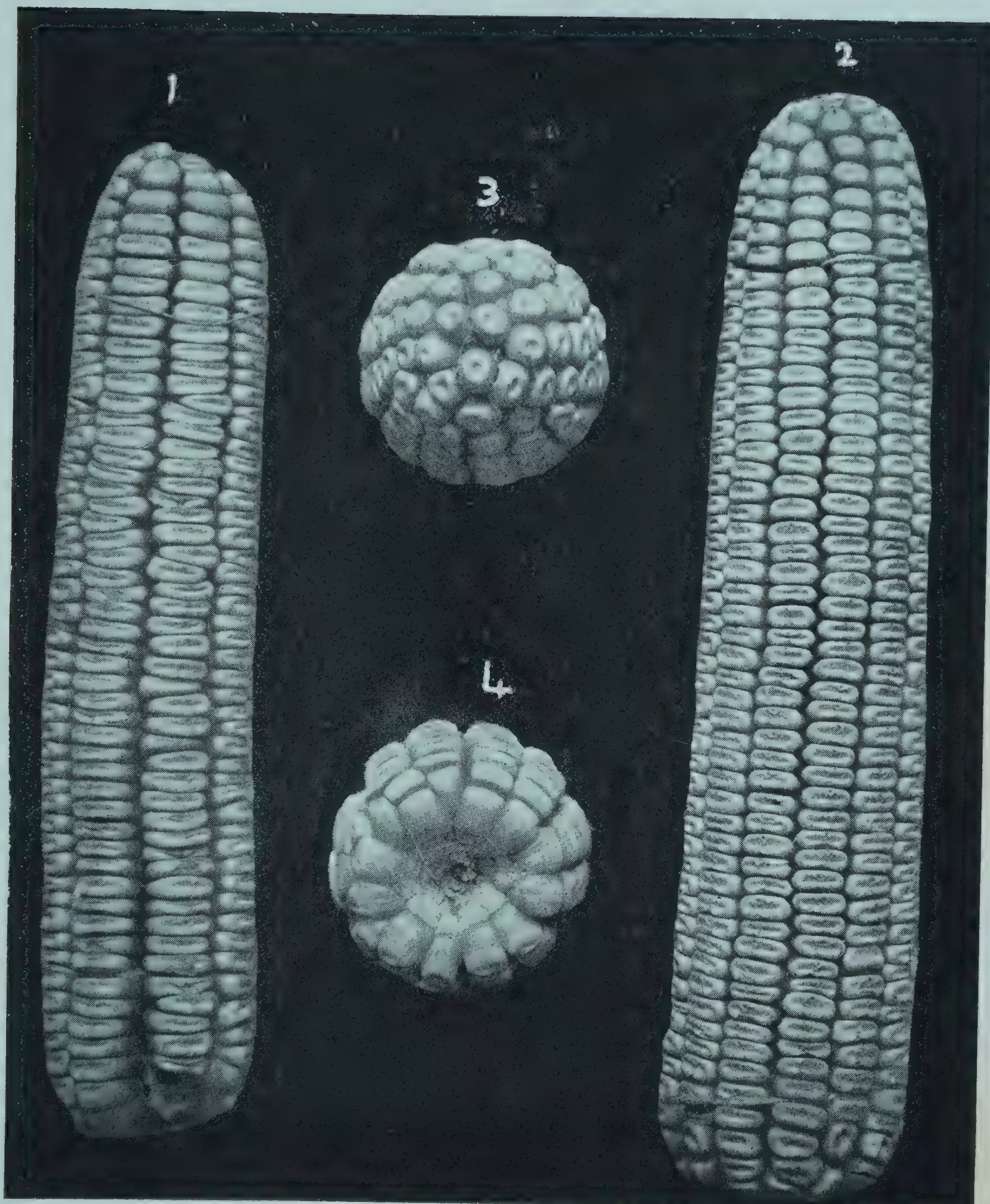
Desirable Characters of Breeding Ears.—A casual glance at an ordinary harvested crop of maize ears conveys little idea of the degree of variation among them. It is surprisingly difficult to pick out 50 uniform ears in a heap of some thousands from an ordinary crop. Experience shews that certain characters of the ears are in certain breeds associated with heavy yields. The following are among the most important characters:—

Uniformity.—This refers to uniformity in appearance, shape, size, colour, indentation, smoothness, etc.

Trueness to Type and Breed Characteristics.—In breeding live stock it is universally recognised that it is desirable to keep to a uniform type. The same principle applies to plant breeding. Stock breeding has been practised on very systematic lines for many generations. Plant breeding on definite lines is much younger, and our breeds of maize are constantly improving. Not only is trueness to type necessary to procure characteristics of the breed, but selection to type is necessary, in order to procure uniformity.

In the case of Salisbury White—an unfixed hybrid—the breed characteristics are not yet fixed; the grower has no standard for a guide, and must choose for himself. Therefore if we wish to establish a fixed type of Salisbury White, a definite standard will have to be set by maize growers themselves. The process of establishing a pure strain of this variety will require great care and attention.

Shape of Ears.—The shape of ears affects yield, quality and uniformity of the grain. The object is to choose the best shape of ear to produce the largest possible yield of shelled grain. Some ears of breeds are perfectly cylindrical, others tapering, and so on.



1. Specimen of 8-row Hickory King. 2. Specimen of Salisbury White.
3. Good tip. 4. Good butt.

Straightness of Rows.—Straightness of row may be of less importance than shape of ear, size of ear and depth of grain, but it certainly has a bearing upon the greater or lesser production of grain.

Colour of Grain.—Yellow grain on a white ear is an indication of crossing. Pale yellow grain has been noticed amongst the crops growing in the Mazoe Valley. Pearl whiteness in colour is a point in favour of white maize. White maize which is dull in colour may be old or may have been damaged in drying; this also happens where grain has been harvested before it is sufficiently dry.

Colour of Cob.—White maize should have a white cob. A red cob in a white breed is an indication of careless selection.

Market Condition.—By market condition is meant the best condition for marketing purposes. Condition includes dryness, firmness of grain on the cob, soundness, maturity and freedom from injury or disease. Maturity is determined by the filling out of the grain; loose grain on the cob usually indicates lack of maturity.

Tips of Ears.—There should be no projection of bare cob beyond the uppermost grains on the ear; this indicates lack of pollination or other defects. The tip of a well-bred ear should be regularly covered with uniform sized grains; well filled tips vary with the season.

Butts of Ears.—To some extent the condition of the butt is a breed characteristic. If the rows of grain end abruptly on a level with the cob, the ear will not yield as much grain (other things being equal) as if they were well carried over. Well-filled butts are more frequently met with than well-finished tips. This is because the butt silks appear first, and remain in a receptive condition until sufficient pollen falls for fertilisation. The tip silks appear last, and it often happens that all the pollen has been shed before they appear.

Uniformity of Grains.—The shape of grains must vary with the breed, thus on smooth ears all the grain should be smooth and on rough ears all should be rough. Roughness on grain is not objectionable, for, as a general rule, it is found that a smooth grain is usually shallow, while a more or less rough grain is usually deep, but roughness may be carried too far.

Shape and Length of Grains.—The larger the grains, if in good proportion to width, the greater the yield. Taken all round, the wedge-shaped grain is the best type to breed to, because it necessarily furnishes the greatest amount of grain for the same size of ear. The proportion of starch is much higher in a thick grain than a thin one, and the proportion of bran and waste much lower, which appeals to the merchant and miller.

Length of Ear.—In the case of length of ear especially, standards can at best be but approximate. Variation of season affects the length of ear.

Space between the Rows.—A wide space between the rows means waste of space that should be filled by the grains, and therefore loss of grain.

Testing Dip.

Considerable interest was manifested at the Agricultural Congress, and subsequently at sundry meetings of farmers' associations, at the dip tester demonstrated by Mr. Blyth in connection with the "Champion" brand of dip. At present, in addition to the analysis performed at the chemical laboratory of the Department of Agriculture, there are three such testers on the market: that named above, Cooper's tester, and the Isometer, originally devised for the Natal laboratory dip. As the matter has come prominently before farmers, the following notes and comments by the Assistant Agricultural Chemist regarding the method of working may be found appropriate and of general interest:—

Sampling.—The bottle used to take the sample must be thoroughly cleaned out with water, and then inverted and drained. The dip in the tank must be well mixed before taking the sample, unless (as is better) the sample is taken after the cattle have been through.

Preparing the Sample.—About 25 to 30 drops of acid from bottle "A" are added to the dip sample, and then the sample is well shaken and allowed to stand about 5 to 10 minutes. In most cases a curdy precipitate will settle out, although some will float on top.

Measuring the Sample to Test.—50 cubic centimetres of the clear liquid is poured off into the measuring flask "B." If a little of the curdy precipitate comes with it, it does not matter. The sample from the measuring flask is now poured into the beaker "C."

Indicator.—A few drops of the indicator "D" is now added to the mple in "C," which will then turn slightly pink. If it does not ırn pink, add a few more drops of "A" until it does turn pink.

Alkali.—About ½ a teaspoonful of the alkali "E" is now added to he sample in "C," which is well shaken, and will turn yellow.

Testing Solution.—The burette "F" is now filled through the funnel "G" with the testing solution "H." Fill right up to the top, and then run a little out until the top is level with the "C" mark on the burette. Running a little out also fills the burette below the glass tap, and carries away any air bubbles that may be there. There is enough testing solution supplied to test about 24 samples, allowing for a lot of wastage.

Gloy.—Add about ¼ of a teaspoonful of gloy to the sample in "C," and shake well.

Titrating.—The solution from the burette "F" is now run cautiously (a few drops at a time) into the sample in "C," which is repeatedly shaken. The finishing point is indicated by the appearance of a dark

blue or violet colour which cannot be mistaken. Stop immediately the blue colour appears and remains after continued shaking. No notice must be taken of the blue colour that first appears and then disappears after a little shaking. There is no need to comment on the method, as it is similar in many respects to the method employed in the laboratory, with the exception that all fluids are filtered, and freshly prepared starch solution is used instead of gloy.

At the present time the instruments available to the farmer for the purpose of analysing dips containing arsenic are only capable of revealing the arsenic content in terms of arsenious oxide ($As_2 O_3$), that is to say, the arsenite content, and not any arsenic that may exist as arsenic oxide ($As_2 O_5$). But it must be remembered that in all dipping tanks there are certain changes continually taking place through the activity of bacteria, some of which are capable of converting or oxidising the arsenites into arsenates, and others of re-converting or reducing arsenates into arsenites. The arsenates play an important role, inasmuch as they have been found to possess about 40 to 50 per cent. of the tick-killing power of arsenites, and possibly some appreciable effect upon the skin of the animal dipped. The neglect of the arsenate content, therefore, is a matter of considerable practical importance, and may lead to mistakes in the re-adjustment of the dip.

Both Messrs. Blyth and Palmer were quite right in their assertion at the Congress that the arsenate figure in dipping tanks that are constantly employed can be regarded as nil, but, unfortunately for this country, there are tanks in which the arsenate content must be taken into account.

In order that a clearer meaning can be gauged, let us take the following example:—A dip analysed by Mr. Blyth's testing apparatus shewed only .08 per cent. of arsenious oxide ($As_2 O_3$), whereas when tested in the laboratory it was found to contain .18 per cent. of total arsenic calculated as arsenious oxide ($As_2 O_3$). If the farmer takes the former figure as the arsenic content of the dipping fluid without taking the arsenate content into consideration, he will have to add to every 1,000 gallons of dipping fluid $1\frac{1}{2}$ gallons of "Champion" dip, whereas if the dipping fluid was analysed in the laboratory, and taking the arsenate content as 50 per cent., the tick-killing power of arsenite, he would have to add only $\frac{1}{2}$ gallon of the "Champion" dip. In view of what has been previously stated, the amount of arsenate, namely, .10 per cent., may be changed into arsenite in a comparatively short period, and instead of the dip being below strength, it will be above strength, without the addition of any further concentrated dip, *i.e.*, the dipping fluid will then contain .18 per cent. of arsenious oxide. On the other hand, with the addition of $1\frac{1}{2}$ gallons of "Champion" concentrated dip, it will have an arsenic content of .252 per cent. Whether this large excess of .16 per cent. over the Government strength will have a scalding or any other serious effect is a matter outside the scope of the chemist.

Many will say that this large amount of arsenate found will be due to the fact that it has been stored in the bottle since date of sampling and the time of arrival at the laboratory. It may also be possible, where large amounts of arsenate have been found in dipping

fluids, that the tank has not been in regular use, but in one known instance where a considerable amount of arsenate was found the tank was in constant use, and the sample was received very shortly after sampling. However, until this has been definitely proved to be the case, caution is necessary.

Further, in many cases it is not possible in the method above described to obtain a clear solution even after hours of standing, and any farmers attempting to analyse this turbid solution would obtain results very far from the truth. In such cases it would be well to have the sample analysed by a competent chemist.

In order to protect the farmer himself he should before he attempts to analyse his dip submit a sample preserved with sulphuric acid to a qualified chemist, in order to see whether arsenate exists or not in the dipping fluid of the tank, and after such tests have been conducted, then, and only then, should he purchase a testing outfit, and even then a sample of the dipping fluid should be submitted to an analyst at intervals, in order to have the arsenic existing as arsenic oxide (As_2O_5) determined.

Slaughter Stock for the Union.

The Beira & Mashonaland & Rhodesia Railways advertise reduced rates for slaughter stock loaded in excess of ten head per short truck consigned to the Union from points north of Bulawayo. The new rates operate from 1st June, 1919.

Infectious Abortion of Cattle.

By L. E. W. BEVAN, M.R.C.V.S., Government Veterinary Bacteriologist, Southern Rhodesia.

Infectious abortion of cattle is one of the most serious diseases of stock, and causes enormous losses in many parts of the world. In Great Britain it is regarded as second only in importance to tuberculosis, while in the United States of America the exact financial loss cannot be even approximately estimated; but from the fact that the disease exists in all sections of the country, both in dairy and range cattle, it can safely be stated that the direct loss reaches into the millions, while the potential loss is likewise enormous and inestimable. In New Zealand this disease is costing the colony annually from £200,000 to £300,000, an estimate based on the increased milk-yield which would result through its eradication.

The presence of this specific disease among our herds in Southern Rhodesia, which was definitely proved by laboratory tests in 1914, constitutes a grave menace to our pastoral industry, and one which should not be treated with indifference. Already it is found to be more prevalent than was at first suspected, and it is probable that its distribution is considerably wider than is generally admitted. The insidious and highly infectious nature of the disease renders it all the more dangerous, and it is often overlooked until a serious shortage in the crop of calves forcibly draws the stock-owner's attention to its presence. Unfortunately the disaster is not limited to the loss of calves and dairy products, but when a farm is infected, movements of cattle to and from it are restricted, and as a grazing property its market value is seriously reduced. It therefore behoves every stockman to obtain a knowledge of the disease, in order that he may recognise it at the onset, and so take steps to arrest its further progress. It is with a view to imparting such knowledge as briefly and simply as possible that these notes are written.

Although there are a number of circumstances which will cause an animal to cast its young before the full period of gestation, the most common cause in this country is the infection of the pregnant female by a particular microbe which invades the womb, and there sets up changes which interfere with the nutrition and development of the calf, and frequently cause its death and premature expulsion.

The infectious nature of the disease is generally indicated by the fact that a number of cows abort in succession; that a tendency to abort persists; that the average period of pregnancy at which abortion is

detected is from five to seven months; that other causes of abortion, *e.g.*, injuries, febrile diseases, atmospheric influences, faulty food or water, poisons, etc., may be excluded; and possibly by the circumstances that abortions have only occurred since the introduction of certain cows or bulls to the herd.

In the majority of cases abortion takes place without effort or inconvenience. There may be no premonitory symptoms, or there may be noticed some uneasiness on the part of the cow; she may "make a bag" rather suddenly, her vulva may be swollen, and a blood-stained mucous or a yellowish discharge may come from it. Frequently the membranes are retained, and are unusually difficult to remove. Their retention may give rise to the usual complications. After the abortion, a thin yellowish discharge may continue to come from the genital organs for several weeks. Subsequent œstrum may be unduly frequent, but the cows may not become pregnant, or may abort again, sometimes as often as three times in a year. These symptoms are by no means constant; indeed, are frequently so ill-defined as to be overlooked. Briefly, a very low "calf-crop," a number of cows shewing a vaginal discharge or retained "after-birth," an abnormal number of cows returning to the bull, the discovery of aborted calves not fully developed, may be the only warning of the existence of the disease.

The character of the aborted materials should be noted. As a rule the fœtus is dead; but it may be alive, in which case it is weakly and generally dies. It may be mummified, but it is rarely putrid. Its umbilical cord may be dropsical. The fœtal membranes may look macerated, the outer membrane having a thickened or leathery appearance. The latter may be covered with an exudate of a light brownish-yellow colour, and sometimes of a chocolate colour, varying in consistency from that of a fluid pus to a tough dough. This exudate is particularly abundant around the "cotyledons" or tufts which are studded over the outer envelope, and which graft the fœtus to the mother. In advanced cases these tufts may be softer than normal and pulpy; they may be distinctly yellow in colour.

The cause of the disease is a microbe or bacillus which gains entrance into the animal ingesting contaminated food or water, or may be transmitted by a bull which can pass it on from sick to healthy in the act of "service." The causal organism is present in the uterine exudate of an affected cow, in the discharge which comes from the genital organs after abortion, in the stomach fluid of the fœtus and in the fœtal envelopes. Its distribution, therefore, is easy and wide-spread. It can retain its virulence for about seven months, if kept in fluid material and free from putrefaction. Desiccation has a destructive influence on its vitality. From this it may be reasoned that the prevailing sunshine and dryness of the Rhodesian winter is against the persistence of the infection outside the animal, and that the watering of cattle from water-pools is to be avoided. It is thought that the microbe does not propagate outside the animal body under natural conditions.

Abortion bacilli do not remain for a long time active in the bodies of non-pregnant animals or persist in the womb of a cow which has aborted. In some cases they cannot be found a month after abortion.

This, as will be seen later, is a factor of great importance in dealing with the disease.

From the foregoing, it will be seen that the infection is easily spread by affected in-calf cows introduced to a clean herd, by a bull which has served an affected cow, by cows which have aborted, and by the dissemination of the microbe in the virulent materials, *i.e.*, the exudate or discharge from an aborting cow, the aborted fœtus and its envelopes. This material may be transported in soiled manure, on the bodies of aborting animals and their companions, on the hands, clothing and boots of attendants, by dogs, jackals and vermin, and principally by food and water contaminated by the discharges of an infected animal.

Once established in a herd, the disease persists in pregnant infected cows, and in cows which have aborted for a short time after the act. In this respect the so-called "queen" cow is a factor of great local importance. It may also persist through an infected bull and through the agency of animals other than cattle. The microbe also remains in contaminated pastures, and in shelters, buildings and kraals. The bacillus being easily destroyed by desiccation, it is probable that the infection remains longer in moist and shaded places.

It is, however, a feature of the disease, and one of great practical importance, that when no fresh infected cattle are introduced to an infected herd the disease tends to die out. Also, as has been previously pointed out, the infection does not remain long in the bodies of non-pregnant animals, or persist long in the womb of a cow which has aborted. In other words, if the animal is not pregnant the microbe can produce no ill effects, and in such circumstances may actually set up a well-marked degree of resistance or immunity. Upon such factors, which have been proved by practical experience and confirmed by scientific observation, methods of dealing with the disease have been devised.

It is important that the first cases of the disease should be detected. If they are missed, the cumulative effects may be enormous. When the slightest suspicion of infectious abortion exists, the owner should notify the Veterinary Department, and by a simple test the accuracy or otherwise of his diagnosis can be proved, and every effort be made to arrest the disease at its onset.

The measures which will probably commend themselves will be the isolation and testing of animals shewing premonitory symptoms, the segregating and vaccinating of animals which have aborted, the careful destruction of all virulent material and everything contaminated or likely to be contaminated, preferably by burning, and if possible on the spot. Experiments conducted at the laboratory have shewn that arsenic has a destructive influence upon the microbe of the disease, and thus the dipping of cattle is an easy and effective method of disinfecting an animal whose body is contaminated with infective discharges from itself or others. The external and internal genital organs of infected females may be syringed with a weak antiseptic solution, such as corrosive sublimate solution, 1 in 4,000; and contaminated buildings, shelters, kraals, etc., should be saturated with a reliable disinfectant, *e.g.*, carbolic acid 3 per cent. watery solution, Jeyes' Fluid, Kerol, Izal, etc.

Infected pastures, and especially moist places likely to be contaminated, should be avoided, and a supply of pure water beyond reproach should be supplied.

The disease is essentially one of the pregnant animal, and tends to die out in the cow which is not "in-calf" in a very short time, sometimes in four to six months. If the bull is withheld from the infected animals for this period, a procedure which is often possible in this country, where there is a well-defined calving period and thus a corresponding period of "service," the infected cows will have derived a certain degree of immunity sufficient to carry them through their next period of pregnancy.

As has been pointed out, the disease tends to die out naturally in an infected herd; in other countries this occurs in about three years when no new strain of infection is introduced. Moreover, an animal which has aborted once, after a certain time ceases to do so. In other words, under natural conditions immunity becomes established in the individual and in the herd. It is believed that the presence of the microbe in the non-pregnant animal can produce no harmful effects, but being present as a foreign body acts as a vaccine and gives rise to immunity. On this basis a vaccine treatment has been devised with a view to imitating and hastening the process which takes place under natural conditions. The vaccine is issued *gratis* by the Veterinary Department, and consisting as it does of dead organisms, can do no harm. The results reported from those applying it are so favourable that its use is to be recommended as an adjunct to the other measures previously described.

It is always advisable to keep a special bull for the "service" of cows which have aborted, and the sheath of this animal should be frequently flushed with a mild antiseptic solution. Care should always be taken not to re-introduce the disease with new arrivals. In addition, a portion of the farm should always be kept free from cattle, and, if necessary, a hay stack should be available to supplement the natural grazing. Such a procedure is of the greatest value not only as a precaution against this disease, but in connection with many other infective maladies of stock in this country.

Finally, when an owner of cattle has reason to believe that infectious abortion exists upon his farm, he should report his suspicion to the nearest official of the Veterinary Department, or write direct to the Chief Veterinary Surgeon, Salisbury. He should state the species of animals affected, the numbers and dates of abortion, and, if possible, the date of "service" of the animals aborted, and should record the yield of calves upon the property for the last few years. He should describe as accurately as possible the circumstances of the outbreak and the symptoms noted, the suspected source of infection and all other factors of possible importance. He should record recent arrivals and departures of stock to and from his farm.

The veterinary officer will be able to obtain material for examination at the laboratory, such as smears of discharge from the aborting cow, material scraped from the tufts on the after-birth, or material from the stomach of the fœtus. Tampon tubes will also be supplied for the

collection of suspected material to be forwarded to the laboratory for cultural and biological tests, and blood will be collected by the "pipette method" for the application of the agglutination test, which is one of the greatest accuracy for the identification of this disease in the infected animal either before or after abortion.

The importance of this disease to the individual and to the pastoral industry in general cannot be over-estimated, and every stockowner should, for his own sake as well as for the good of his country, be on his guard against it.

Extracts from the Report of the Director of Agriculture

FOR THE YEAR 1918.

Presented to the Legislative Council.

The preponderating factor has continued to be the war, and all progress and development recorded have been influenced, mainly prejudicially, by war conditions. Our advance has been retarded and our prosperity checked by this cause, and allowances must be made accordingly; indeed, it is a matter for thankfulness that the development of the agricultural industry has not been more seriously hindered than has actually been the case. A lack of labour has been experienced, boys in the north being required for military transport purposes, whilst the local native has not availed himself of the opportunity to acquire industrious habits. Another adverse factor has been the weather, heavy rains and lack of sunshine during the growing season seriously diminishing all our crops.

In other respects, happily, more favourable circumstances prevailed; veld and water supplies were good, also the health of stock and the increase of our flocks and herds. Implements, farming accessories and machinery, though scarce and dear, were never unobtainable, the shortage being most severely felt in sacks for our grain and dipping materials for tick eradication. Outlets were found for all the maize produced, which might not have been the case had the crop been an

abundant one. Markets were developed for our surplus cattle, both to the south and for military purposes to the east, whilst in spite of difficulties progress has been made with the erection of the canning factory at Odzi.

A creamery and bacon factory came into existence during the year at Marandellas, whilst proposals are under discussion for the establishment of cheese factories at Bulawayo and Enkeldoorn. The prices of bacon from the factory at Salisbury were adjusted during the year in favour of producers. The fertiliser factory in Salisbury is extending its activities. The cement factory near Bulawayo has been fully occupied, serving the agricultural interest by producing cement for irrigation works and dipping tanks all over the country, whilst at the end of the year the manufacture commenced of a concentrated dipping fluid, using arsenic from the Champion Mine near Umtali. During the year two mills for grinding wheat and preparing various products from maize and other grain were established, the one at Salisbury, the other at Gwelo.

Though active immigration has been in abeyance, there has been a not inconsiderable development of new farms. Sales of land, both previously unalienated and privately held, have been numerous, and arable as well as ranching land has been taken up.

Cattle.—The cattle industry, the mainstay of our agricultural property, continues making steady and satisfactory progress. No new element, harmful or favourable, has appeared, but in every direction increase in numbers, in organisation of trade, in attention to the feeding, care and health of stock, in interest and comprehension and in the desire to improve methods and profits, is noticeable. More and better bulls is still the great need of the country—increasingly felt as this truth becomes generally recognised. The difficulty of supplying this want is greater as the demand grows and as the prices increase, and is likely to become even more pressing as time goes on.

During the year 1,020 head of cattle were brought into Southern Rhodesia. Only 47 bulls and 108 heifers were imported from the United Kingdom, as against 99 and 100 respectively last year, whilst from the Union 286 bulls and 579 heifers were procured, as against 239 and 2,527 respectively in 1917. These figures shew a decrease of bulls from England, due undoubtedly to higher prices and the difficulty of importing. The number of heifers brought up from the Union is materially less than in previous years, probably owing to the extension of stock farming there and the general increase in the demand for cattle.

The number of cattle exported from Southern Rhodesia during the year is as follows:—

To the Union		12,153
Via Bulawayo	7,908	
Via Messina drift	4,245	
To Portuguese East Africa		1,378
To East Africa		9,388
To the Belgian Congo		50
		22,969

The total export of cattle since the inception of the trade now amounts to 48,488 head, of which 37,672 have gone into the Union. At the beginning of the year arrangements were made for free export of cattle to the Union from Mashonaland without certain hampering restrictions which previously had prevailed. The Imperial purchase of cattle for East Africa was also a welcome, if temporary, outlet for our surplus stock, which, in spite of interruptions through floods and difficulties regarding shipping, was carried through with success, and only ended with the termination of hostilities. The practice of selling oxen by live weight has been introduced at certain of our markets, and is likely ultimately to become a general practice. Stock sales were more numerous than in former years, and a regular and considerable trade is growing up at recognised centres, with healthy rivalry between the competitive markets.

Live stock was affected by the incessant rains and cold wet season, especially calves and sheep, and there was an unusual amount of minor ailments of stock, which, however, disappeared with the rains. The winter proved exceptionally favourable, water and grass being abundant, and veld fires rare until quite late in the season, whilst owing to the moisture in the ground the grass came away exceptionally early in the spring. The winter calving was good, and stock kept their condition throughout the year. The very cold summer had a marked effect on the milk yield, and there was a noticeable reduction in the cream from this cause. The number of cattle in Southern Rhodesia has increased during the year to about 1,200,000 head. The increase of horned stock is entirely satisfactory, and furnishes renewed testimony of the possibilities for cattle raising in Rhodesia.

Compulsory dipping throughout the country, except in the more remote districts, has been put into force, and must in time exert a very great influence not only on the health but also on the condition of cattle, particularly in the winter season of emaciation. Want of adequate supplies of cement has unfortunately militated against the construction of tanks, and thus upon the fullest application of the principle; but in spite of this, tanks have increased from 991 to 1,263, and this number is constantly added to, 80 being under construction. The natives are taking kindly to the dipping of their cattle, ocular demonstration and experience going far to convince them of the benefits of the process.

Sheep and Goats.—The numbers of sheep and of goats remain about stationary, the great majority being owned by natives. The weather was particularly unfavourable to sheep in the districts where they are chiefly found, the mountains of our eastern border. The country still draws heavily on the south for its mutton, 22,027 sheep and goats, almost entirely the former, having been imported, chiefly for slaughter; whilst exports aggregated 7,390, made up of 2,658 to the Union, 2,330 to the Congo, 2,000 to the Tati, 341 to Northern Rhodesia, and 61 to Portuguese East Africa.

Dairy.—There are good prospects of a rapid development in the immediate future in dairying, and the recently appointed adviser and itinerant instructor in this subject reports favourably upon those districts which he has so far seen: Salisbury, Enterprise, Lomagundi,

Bulawayo, Bulalima-Mangwe and Victoria, where he has visited 121 farms and attended several meetings in some three months' time. There is great scope for the services of this expert in dairying and in pig raising, as the knowledge of most farmers in these subjects is very rudimentary and their methods correspondingly crude. At the same time, there is a marked desire to improve and to develop side lines into main lines and high roads to wealth.

Pigs.—The high price and small supply of maize and other grains militate against the popularity of the pig, which, with the return of normal conditions and the development of dairying, is likely ere long to come into its own again.

Poultry.—To stimulate the poultry industry, during the year the appointment was made of an expert to act as adviser and itinerant instructor in matters appertaining to this side line of agriculture. After extensive tours visiting both farmers and urban poultry keepers and coming in touch with the existing poultry societies, this officer reports very favourably on the prospects in Southern Rhodesia. As regards climate, food supplies and disease, our conditions compare favourably with other countries. There is, however, in his opinion, need of preventive measures against spread of disease, also of action to mitigate depredations by wild animals and thieving, whilst the industry can be greatly encouraged by means of experiments, competitions, organisation of trade and general education of the public interested regarding the possibilities and modern improved methods of poultry farming.

Brands.—Under the Brands Ordinance, 323 new brands were registered, compared to 328 in the previous year, giving a total at date of 6,768.

Pounds.—The pounds have been increased from 38 to 41; 4 having been established and 1 abolished.

Vermin.—The extermination of baboons has received attention, and a system instituted of State-aided hunts in which the natives are brought together under official control, and drive the baboons out of their haunts, to be shot by Europeans who collect at appointed places for the purpose. So far, good success has followed the adoption of this plan. The claims made for rewards for the destruction of wild dogs (£6 13s. 6d.) continue to be insignificant, whilst the destruction of leopards, lions and other harmful animals is sufficient recompense in itself to secure their annihilation at every opportunity.

Labour.—Labour has been scarce, alien recruiting having been largely stopped through disturbed conditions beyond our borders, whilst the disinclination of the local native to work has been accentuated by influenza, both through the mortality and the not unnatural desire to remain at or return to their kraals on account of the epidemic. It is unfortunate that the labour supply should be so short during the most critical months of the season, and this will not be without its effect upon the crop production next season. The disinclination of the indigenous native to acquire wealth by methods of industry shews little, if any, sign of improvement from year to year, neither education, proselytisation, prosperity nor famine appearing to have much effect.

Statistics.—The collection of statistics is now a recognised branch of the activities of the Department, and as the benefits of such returns and the interest of comparisons come to be realised, so the exactness of the figures furnished increases. There is internal evidence of considerable precision in the filling in of the forms issued, on which the accuracy of our aggregates depends, and acknowledgment is due to the intelligent co-operation of the community in this direction. The number of belated returns, or those unwillingly rendered, is surprisingly few, though some remain always to throw an element of incompleteness on the whole. The number of farmers in the country remains practically stationary.

Legislation.—Legislation of an agricultural character during the session of 1918 consisted of the following laws, of which the titles sufficiently indicate the scope. In a young and progressive country frequent amending Ordinances are necessary as conditions change, particularly as the degree of public enlightenment on certain subjects grows. It being impossible to legislate far ahead of current public opinion, the necessity arises of constant revision:—

1. Animals Diseases Amendment Ordinance.
2. Pounds and Trespasses Amendment Ordinance.
3. Rhodes Estates, Matopos and Inyanga, Transfer Ordinance.
4. Cattle Cleansing Ordinance.
5. Locust Destruction Ordinance.

War Settlement.—The selection of land for the purposes of allotment to soldier settlers free after the war has received attention. To date 1,172,732 acres of unalienated land have been examined, from which 97,140 acres have been chosen as suitable for the purpose in view and 56,440 acres provisionally, the remainder being not adapted for the class of farming the settlers are likely to take up, being better fitted for pastoral farming in large areas or for large capitalists, whilst a considerable portion was waste land. There still remains a considerable area to be inspected as time permits, in order to secure the 250,000 acres proposed to be utilised in this manner.

Crops.—Crops generally were much injured by the prolonged cold sunless wet weather during the critical period of the growing season. Ploughing, cultivating and even hand weeding were rendered impracticable by the sodden condition of the soil, whilst growth was stopped by the cold and the absence of sunshine. Some of the crops were lost and the yield everywhere reduced by these adverse conditions. The rains persisted late and injured the maize at tasselling and reduced the yield of all crops, though to a less extent than was at one time feared. At shelling the maize cobs proved disappointing, not yielding grain at the usual rate, whilst samples generally were inferior in appearance. An oversea market being happily found for our surplus, prices were well maintained—some compensation for the increased cost of production and the decreased return per acre. High prices for implements, tools and especially of spare parts were manifest, but it is a matter for wonder that such things were obtainable at all.

The new season opened favourably with good though rather late rains, and in spite of some loss of time and labour through influenza,

the seed for the coming season was sown under exceptionally favourable conditions.

The maize harvested by European farmers amounted to 591,722 bags (1,775,166 bushels), and the yield per acre was 3.08 bags, the lowest on record. This amount is only about two-thirds of the previous year's crop, but even so, left a surplus for export. The statistical returns for recent years are sufficiently interesting to be given here, indicating, as they do, a steady increase of acreage until this unfavourable season and a fluctuation in yield varying with the weather.

Season.	Acres.	Bags.	Average yield in bags per acre.
1913-14	161,268	634,133	3.93
1914-15	167,012	914,926	5.47
1915-16	174,647	680,285	3.88
1916-17	203,150	938,130	4.62
1917-18	192,148	591,722	3.08

The supply of ground nuts was inadequate for the needs of the oil factory and other markets, this crop suffering relatively more than any other from the wet. Beans, kaffir corn, sunflower, melons, pumpkins and hay and fodder crops were all short owing to the same cause. Other crops were produced in quantity adequate to local demands, and as production increases sale beyond our borders, or conversion into other forms of feeding, must be looked to increasingly. Thus potatoes could readily be grown both in summer and winter in quantities to supply factories for starch, glucose and other products, and several other crops could be grown on a much larger scale than is to-day the case if only there was an established demand and market for them.

An increased interest is shewn in side crops or rotation crops supplementary to the predominant one of maize.

Wheat shewed an increase of acreage of 8 per cent., and a yield equivalent to about one-third of our annual requirements, a larger proportion than that hitherto reached, and attributable mainly to the realisation of the need for local production during these times. There was a particularly good wheat crop in Melsetter, which largely compensated for failure of other European and native crops there through the superabundant rainfall of 94.25 inches.

Tobacco.—The tobacco crop was disappointing, both in quantity and quality, owing to phenomenally unfavourable climatic conditions coupled with the lack of readily available fertilisers. Owing to war conditions, leaf was more saleable than would otherwise have been the case. The recently appointed tobacco expert stated that after inspection of the principal areas in which tobacco is at present grown in Rhodesia, he considers the conditions adapted to the production of tobacco excellent, and that the production can be increased to millions of pounds annually if export markets can be established and more farmers induced to pay attention to this crop. Besides visiting and advising the growers on their farms, he has devoted much time and attention to the classification and sale of the leaf in the Tobacco Warehouse, Salisbury, and to advis-

ing the Co-operative Society in its endeavours to establish the trade, as well as the culture and curing on a proper, sound and secure footing, a consummation towards which good progress is being made.

Cotton.—Cotton, to which the tobacco expert is also giving his special attention, is entirely in an experimental condition, and its suitability to the country is still problematical. Experiments are now in progress for the second season, but before any final decision is expressed, trials should be conducted in the lower and warmer regions enjoying a longer growing season and a less severe winter than the high lands on which European settlement has hitherto mainly concentrated. A decision was reached last year to give this crop a full and fair trial, in spite of the failures in early years, and this policy will be carried out and a conclusion reached on definite, clear and scientific grounds, after giving this important crop the fullest trial in different parts of the country.

Grading.—Maize grading has been carried through as in past years. Difficulty was experienced in securing graders, a trouble not peculiar to this part of South Africa, but which it is hoped by arrangements since made will not recur next year. The number of bags that passed through the graders' hands for export was 81,440, as against 396,364 in the previous year. Of these, some two-fifths were first grade and the remainder second grade.

Irrigation.—The position as regards irrigation in Southern Rhodesia, indicated by the Agricultural Engineer, shews that the total area examined and reported upon by departmental engineers in the past as irrigable extends to 22,358 acres, whilst statistics shew that the land actually cropped under irrigation during the year was 5,697 acres, or one-quarter of the known irrigable area. He states that wheat, oats and forage comprise two-thirds of the irrigated area, the remainder being citrus fruits, potatoes and vegetables. There is thus great scope for extension in this direction, dependent mainly on the creation of oversea or local markets. Irrigation farming is tending in two directions, on a large scale for citrus fruits, also for cereals, and on a small scale, but much more generally, for the provision of green fodder for stock during our long dry season in the case of dairying and mixed farming, also for cattle on large runs whenever such conveniences can be provided. Several new projects of some size are under consideration. During the year the Engineer reported favourably on irrigation projects affecting 1,476 acres, in many instances furnishing all necessary plans and specifications for the execution of the work.

Under the Water Ordinance 26 applications were investigated and grants given in 17 cases, the remainder being in course of consideration or awaiting reference to a Water Court. The number of rights to water now actually defined under the Ordinance is 67, the investigation of which has incidentally brought to light points in the law which will ere long demand amendment.

The charge of all meteorological stations and records is now assuming large proportions, and the preparation for publication of the annual returns entails much detail work, whilst a new importance attaches

thereto, in view of the extension of the science and practice of aeronautics. The need for a hydrographic survey is being ever more urgently felt, in order to give reliability to the forecasts on which necessarily much capital outlay has to be expended, and to guide the Engineer and the farmer in their decisions.

Chemist.—In the chemical laboratories the work performed has been of a varied nature, 1,631 separate analyses having been made, 1,501 being dipping fluids, 66 viscera for detection of poison, and the rest consisting of soils, fertilisers, bat guanos, limestone, wood ash, water, triplites and miscellaneous samples. The technical control of artificial manures under the Fertilisers, Farm Foods and Pest Remedies Ordinance also receives attention in this branch. Two Chemists are now engaged, but the volume of routine work is such that it is not possible to devote attention to those researches which are urgently necessary for the advancement of the agricultural industry, such as a systematic survey of our soils or the examination of the nutritive properties of our natural grasses and locally-grown crops. The services of the Chemists are in much request for advice and investigations for individuals, which, however useful to the enquirer, do not benefit the community as a whole. The practice of charging for such private work tends to prevent abuse and to ensure the *bona fides* of applicants, but the practice will have gradually to be more rigorously enforced. This aspect is particularly noticeable in the case of examination of dipping fluids. It is important that the mixture in dipping tanks should be preserved at proper strength, but it is not right or fair that samples should be so carelessly drawn, as is often the case, whereby the time of the analysts is wasted. Not unfrequently sampling is done by natives, the sample being often taken with the same tin as is used for adding the concentrated dip to the tank, or placed in unclean bottles containing ingredients such as iron, lime or permanganate, which seriously affect the arsenical solution. Samples are taken from unstirred tanks, and in other ways, for lack of reasonable attention, the work of the analysts is vitiated. Much unnecessary effort could be spared if farmers would acquire the habit of making a few simple observations for themselves with regard to evaporation, leakage and the consumption of dip on the coats of their cattle. Now that dipping is general and the public have learnt the means of controlling their tanks, perhaps the time has come to make a charge for analysis, which is for the individual's own advantage, and this is the more legitimate as there are a number of competent private analysts whose services are now obtainable in the country.

The manufacture within the Territory of a dip from arsenic locally mined is a new feature of much promise, and has been especially welcome in view of the difficulty of obtaining dipping preparations from abroad. The services of the laboratory were placed at the disposal of the manufacturers in their initial investigations. The product is now on the market.

Help to the farmers has also been given in the examination of morbid specimens to determine if poison has been the cause of death. In just half the cases arsenic was found; in many instances doubtless no poison was concerned, in others obscure vegetable poisoning is pre-

sumed, but here again there is need for prolonged and patient toxicological research before means of ascertaining definitely the various veld poisons and their origin can be discovered.

The laboratory accommodation, like that of the rest of the offices of the Department, leaves much to be desired, and is the cause of not ill founded complaint.

Entomology.—The Entomologist, though short-handed, has continued the study of numerous important pests, and can record further progress in our knowledge of the habits and life history and hence of the means of combating our insect enemies. Such investigations, continued over a series of years now, have provided us with a fund of information to place at the disposal of farmers, but the subject is so extensive that there is room for much more research along these lines. The losses to our principal crops, maize and tobacco alone, are so great that hundreds of thousands of pounds sterling could be saved by attention to preventive and curative measures already known. Ticks and flies are the cause of enormous losses amongst live stock, against which the dipping tank is a valuable protection. Vast regions of Rhodesia and Central Africa are cut off from beneficial occupation of man by reason of the tsetse.

Against such plagues active operations are being carried on, and much of the Entomologist's time has been taken up in connection with the tsetse, to check which a far-reaching experiment was instituted, but had to be postponed for a season on account of the outbreak of influenza.

Agriculturists.—The work of the Agriculturists has been curtailed through the continued absence of one officer on war leave throughout the year and of the other for half the year through sickness. However, their principal activities have been carried on, though necessarily in a diminished measure. There is a very attractive field for research in botanical investigation of an economic character regarding the possible utilisation of indigenous plants as grain, for fibre, for timber and tanning, as medicines, scents, also poisons, parasites and weeds.

Specimens are from time to time collected or received from observant farmers and others, but of late it has been impossible to give the subject the attention which it deserves, in spite of the co-operation of the local Munitions and Resources Committee and of the Imperial Institute in London, simply for lack of time and staff to devote to these subjects, the potential value of which is fully recognised. For the same reason, it has not been possible to give support to the proposals for a botanical survey of Rhodesia in conjunction with that being initiated throughout the Union.

The system of co-operative experimentation, though subject to great disappointment from failure of farmers to furnish reports, is yet of use in spreading the idea of the possibility of crops other than the ever-preponderant maize, and it is realised that if the distribution can be followed up with personal inspection by members of the Department, a greater number of results would be obtained. The addition to the variety of crops grown is one of the prime needs of our agricultural

practice to-day, and it is only by free and generous distribution that the appearance, properties and value of new crops can be brought home to the farmers. Only sorts likely to answer are sent out after several years' successful trial at the experiment stations. Most of the seed too comes from the Government farm, Gwebi, especially since oversea supplies have been unobtainable.

During the year the distribution effected consisted of 656 parcels of seed to 290 applicants, consisting of 34 different sorts.

Citrus.—In spite of obstacles, the citrus industry promises soon to attain to considerable dimensions, as trees planted during the past few years gradually come into full bearing. To-day statistics shew there are 57,211 citrus trees of all kinds in bearing and 90,009 not yet bearing fruit. Of this total of 147,220 trees, 114,692 are oranges, 20,984 lemons, and the rest limes, naartjes, grape fruit and pampelmous. The difficulties alluded to above include export owing to war conditions, lack of suitable cases for packing, and, until recently, want of superior nursery trees for planting out. Careful watch has been kept for the citrus canker which has caused severe losses in the south, but happily so far it does not seem to have established itself here. Measures of control under the Orchards Inspection Ordinance, 1914, have been instituted as protective and precautionary steps. The Citrus Adviser has continued with success his task of instruction and encouragement.

Forestry.—At the forest nursery the production of trees and shrubs for sale and distribution has been actively pursued, and meets a want not otherwise provided for. The extension of tree planting deserves every encouragement, whilst the decoration of our homesteads and public institutions is only a degree less desirable. The nurseries have been conducted with success, and at the nominal prices charged with some return for the 107,000 trees and shrubs sent out. Actual sales realised £239 19s. 7d., and free issues at the same rates were made to a value of £152 6s. 2d., a total of £392 5s. 9d., against £409 in 1917. The function of supplying the western side of the country in a similar manner has been transferred to the nurseries of the Rhodes Matopos Estate.

A scheme of tree planting on the Commonage has been adopted by the Salisbury Municipality, involving the planting up in the first season of 35 to 50 acres with trees to the number of about 40,000 to 60,000 supplied from the Government nursery. Considerable plantations are also being established at the Mazoe Dam and on the Matopos and Inyanga Estates.

Agricultural Experiment Station.—At the agricultural experiment station, Salisbury, the trial of new crops and varieties and certain cultural experiments have been continued, though in rather less a degree than in normal times, and with many disappointments, owing to the abnormally dull cold wet season. The results of the experiments have been largely made public in the *Agricultural Journal*, and need not be expatiated upon here. The interest shewn by numerous visitors testifies to the useful purpose of this out-door laboratory and of the practical nature of the experiments conducted. There are many problems relating to arable farming and to live stock still awaiting solution,

such as crops for the sand veld and magnesian soils, the utilisation of farinaceous products, the production of fibres, the fattening of cattle. feeding of milk cows, pigs and sheep, and generally the increase of the producing powers of our farms.

Government Experiment Farm, Gwebi.—The experiment farm at Gwebi has continued to furnish instructive results, published from time to time in the *Agricultural Journal*, the details of which it is not therefore necessary to refer to here. The unfavourable season affected the yields and the distinctiveness of results, also the quantities of produce sent away. The investigations conducted involved 52 separate enquiries, and the crops were divided over 175 plots, and 31 different kinds were grown. The conduct of these experiments entails a very considerable amount of labour, especially since accuracy is the first desideratum. The cultivated area extended over 550 acres, so that the experiments may be regarded as carried out on practical lines. No additions, though much needed, were made in any way to the buildings, equipment or live stock on the farm, and the work continues as in past years to be carried on under very adverse and unfavourable conditions.

The Friesland cattle at the Gwebi were purchased five years ago out of advances, not out of administrative funds, and the decision was reached during the year to dispose of them in the hope of replacing them by a beef breed, Hereford, Devon or Aberdeen Angus, for any of which there is a very keen demand for bulls. Accordingly, the herd was dispersed by auction sale, very satisfactory prices being realised. The original herd was selected at the dispersal sale of Mr. Maclaurin's Friesland herd in 1913, and no additions by purchase were made. The price paid for the bull Dutchland Colantha Sir Cornucopia and 14 cows and heifers was £601 5s. Sales of 20 bulls bred from these cows brought £609 6s. 9d., which was set against the purchase price. The disposal of the old bull and cows and the natural increase in young cows, heifers and calves, numbering in all 42 head, realised £1,279 19s. The small nucleus of a herd of nine Shorthorns was sold off in 1916 for £298 10s. The present position, therefore, is that the Government farm is without a stud herd of any pure breed to consume the pasture and the quantities of forage and root crops produced in the course of the cultural experiments. The desirability of keeping such a herd has been fully recognised.

The merino flock has continued to be maintained on the farm, proving that a limited number of sheep can advantageously be kept on a mixed farm of this character. The flock at the end of 1918 numbered 149, and during the year there have been 81 sold and 9 consumed, whilst the clip of wool amounted to 800 pounds. No pigs or poultry are kept on the farm owing to lack of facilities.

Owing to the lighter returns, especially of ground nuts, velvet beans and Sudan grass, the total value of all crops grown amounted to less than last year, £2,352, as against £3,175. Of this, the greater proportion was consumed on the farm, but produce sold in the form of hay, grain and seed, or used at Government institutions and in free distribution to the public for further experimental purposes, amounted to £936.

The total costs and proceeds of the Gwebi farm to the nearest pound were as follows:—

Receipts.

Produce sold and issued free	£401
Produce in hand for sales	129
Produce issued to Government institutions	406
Profit on live stock (sales and difference on valuation)	624
	£1,560

Expenditure.

Salaries	£641
Expenses (unaudited)	817
	£1,458

To the credit of the farm must also be set the value of the experimental work carried on which cannot be assessed in terms of money, and the fact is to be also remembered that the detail of cultivating, handling and harvesting numerous small plots and weighing the returns from each involves a much greater amount of labour than would the mere treatment of the land on crops on commercial lines. It is not the object of management to make the farm pay its way, and the fact that this has occurred is not recorded as an indication of success, which should be measured by experimental results and extension of work and development of the farm, not by financial returns.

It is a matter of regret that it has not been found possible during the year to establish an experiment farm for the benefit of the sand veld.

Devon Cattle.

Mr. Charles Morris, of Highfield Hall, St. Albans, England, the owner of the famous "Highfield" herd of Devon cattle, bought the champion Devon bull at the recent annual bull sale at Taunton for the sum of 250 guineas.

rogen, cent.	Potash, per cent.	Nitrogen present as	Potash present as	Date of registration.
·10	3·52	Blood	Wood ash	2-1-18
·62	2·14	do.	Ashes	6-9-18
·15	5·43	do.	do.	15-10-18
·02	5·20	do.	do.	15-10-18
·50	2·00	Bone	Sulphate	5-11-18
·00	3·00	do.	do.	5-11-18
·00	4·50	do.	do.	19-11-18
·00	4·00	Organic	Carbonate	6-9-18

Contagious and Infectious Diseases of Poultry.

By Arthur Little, Poultry Expert.

Roup.—This disease is highly contagious, and always carries with it an offensive odour proceeding from the mouth, nostrils or eyes. Cold, damp weather and draughts favour its development. As in all cases of disease, a bird one or both of whose parents have suffered from it is more susceptible to this disease.

Symptoms.—There are three forms, viz. :—

(1) The nasal form.
(2) The eye form.
(3) The mouth and throat or diphtheritic form.

In the nasal form the germs invade the mucous membranes of the upper air passages; the nostrils exude a sticky fluid, and are frequently closed up, and the bird breathes through the mouth. In addition, this fluid frequently accumulates in the frontal senus—the cavity in front of and below the eye—causing a swelling in this part; the offensive odour is always present.

In the eye form the mucous membrane of the eye is affected, inflammation is present, the lids become adherent and much distended; the roupy odour is also present.

In the throat, mouth or diphtheritic form yellowish or yellowish-white patches appear on the mucous membrane of the mouth or throat, or both. Attention is usually drawn to these by the appearance of yellowish sores on the corners of the mouth. The odour again is present, and frequently the bird dies of suffocation, due to the closing of the throat by the growth of the membrane. Frequently this membrane is only present low down in the throat, and unless the mouth is opened wide, and the sun or a light is allowed to shine right in, it is not noticed.

The germs of this disease can be carried on the hands, clothing, feeding utensils, coops and on the feet of the birds. Birds so affected are better destroyed at once and the carcases burnt. Thorough cleansing and disinfection of houses, runs and coops, etc., is necessary where an outbreak has occurred.

Some persons contend that human beings, especially children, in the immediate vicinity of birds suffering from diphtheritic roup, can become infected. There is no doubt much to be said in favour of this theory, although it has not been definitely proved.

CHICKEN-POX OR WARTS.—This disease is contagious, and usually appears in the autumn, winter and early spring, especially during the first-mentioned season. It affects the face, comb and wattles, and appears to have some relation to roup, for frequently the two diseases appear in the same flock simultaneously.

Symptoms.—It first appears as yellowish-brown pimples, which increase in size; the top then sloughs off, forming a dark ulcerated sore. These sores coalesce, and in severe cases the comb becomes partly eaten away, the edges of the eye-lids becoming affected and adherent.

Treatment.—If the pimple has not commenced to ulcerate, touch lightly the top of it with the end of a match dipped in pure carbolic acid, and after 24 hours apply carbolated vaseline. If the sores have developed, treat them with iodine or paraffin, not with vinegar or carbolated vaseline. All birds suffering from this disease should be at once isolated and a careful watch kept daily on the remainder.

There are several theories as to the cause of this disease:—(1) Mosquitoes—this is the most feasible, in view of the fact that only the face, comb and wattles are affected, *i.e.*, those parts not covered by feathers; (2) an overheated state of the blood; (3) that it is caused by a specific bacillus.

It is to be hoped that shortly experiments will be carried out in order to definitely decide the cause, for it is very prevalent during the seasons mentioned, and is the cause of a large number of deaths and weak unprofitable birds.

ECZEMA.—This is a contagious disease often mistaken for chicken-pox or warts, and at a casual glance it is certainly similar.

Symptoms.—It usually affects the same parts, viz., the face, comb and wattles. It appears as a small blob; this breaks, exuding a watery fluid, which affects all the parts over which it spreads, forming a dirty brown sore.

Cause.—It is usually caused by the food given being of too rich a nature. When once it appears it rapidly spreads through the flock by means of the fluid exuded coming in contact with the face, comb or wattles of another fowl.

Treatment.—Isolate every affected bird, and treat the sores by dusting them with boracic acid powder and starch powder in equal quantities; put Epsom salts in the drinking water, and see that the birds have plenty of wood charcoal always before them.

COCCIDIOSIS (S.A. fowl sickness).—This is a disease which is very prevalent in Rhodesia and South Africa generally. It usually makes its appearance immediately previous to or at the commencement of the wet season. It is very contagious and rapidly fatal.

Symptoms.—It is an inflammatory condition of the lining membrane of the intestines. In the acute stage the onset is sudden; there is loss of appetite, increased thirst, and the birds appear dull, droop their heads and stand about in a listless manner. There is always diarrhœa of a fluid-like nature and of a yellowish-green colour. In the chronic stage the featherless parts are pale, the comb is of a bluish tinge, the

head droops, the eyes are half closed and the feathers ruffled. The gait is difficult, and there may be paralysis of both limbs. The diarrhœa is the same as that in the acute stage, and the bird lingers on perhaps for a few weeks until it finally dies of weakness. Frequently many of the birds are found dead (usually under the perches in the morning) before the disease has been noticed; in other cases they are ill for a few days and then die.

Cause.—The disease is due to the presence in the intestines of a parasite known as coccidium or eimbria belonging to the Protozoa. Under the microscope it is seen as a regular, ovoid or spherical shaped body, and it is quite distinct from the rod-shaped micro-organism of fowl cholera, which stains at the ends with fuchsin, while the middle remains unstained. The latter is best seen in the blood smears, and the former in the contents of the intestines, and in the fæces.

Post-mortem Appearances.—The caeca are distended to about double the normal size, and the contents of these consist of offensive-smelling yellow pasty-looking material. The mucous membrane is inflamed, and this may be so severe as to shew shedding of the epethelial lining; it is usually found in patchy areas. The remainder of the large intestine may also be similarly affected.

The coccidia will live for 12 months, especially if their surroundings are of a moist nature.

Method of Infection.—The coccidia (which exist in the moist ground) rise to the surface immediately the surface becomes moist with heavy dew or rain. These the birds, when picking up their food, absorb; they increase rapidly, and the droppings subsequently become a source of infection. Wild birds are subject to the disease, and will carry it from one place to another, both of themselves and by settling among a number of fowls, their feet becoming contaminated with the droppings, thus carrying the disease to the next lot among which they settle.

Treatment.—Preventive Measures.—If the disease is known to be present in the district, each poultry keeper should thoroughly spray every day the floors of the house, the perches and also the ground around the house with a solution of hot water and kerol or similar disinfectant (three tablespoonfuls of kerol to a paraffin tin of hot water), and put into every quart of drinking water one-half a thimbleful of powdered catechu (which can be obtained of any chemist). Similar methods should be adopted if the disease is present, and in addition isolate at once every bird that is in the slightest degree off colour, and kill every one that shews the symptoms in a marked degree. *Burn the carcase.* A frequent source of infection too is by travelling coops, birds from infected quarters being sent by rail to markets, etc., and also by the native fowls brought into the towns and hawked from house to house.

Blackhead.—This disease is scientifically known as entero-hepatitis, because it affects the intestines and liver. The name originated from the fact that the head is supposed to turn blue or bluish black, but this is not always the case. It usually affects turkeys, especially the young ones, and fowls and chickens to a lesser degree.

Symptoms.—These are not noticeable until the disease has progressed for some length of time. The bird is dull, the wings and tail

droop, the feathers are ruffled, and later take on an unkempt, uncared for appearance. There is diarrhœa of a yellowish-green colour, and the droppings contain millions of germs, but these do not live long outside the body, as do those in coccidiosis. There is loss of appetite, weakness, emaciation, and from three to ten days after shewing the first symptoms the bird usually dies.

Cause.—The disease is caused by a single-celled animal organism or parasite, which is found in the diseased areas of the liver and intestine. The water or food becomes polluted with the droppings, and other birds are thus affected.

Post-mortem Appearances.—The external walls of the lower part of the intestine are inflamed and the inner walls shew ulceration. The liver will be seen to be affected by many areas of disease, which are whitish-yellow in colour and round in shape.

Treatment.—Preventive Measures.—The disease is sometimes spread by a fowl or turkey possessing great resistance having a chronic ulcer of the bowel due to this germ. When buying birds, make sure they are not from a flock where blackhead exists. Frequently permanent infection of the premises is the result of an outbreak, making it impossible to carry on profitably. Disinfection should be carried out thoroughly, all sick birds being isolated at once, and the worst cases killed and burnt.

Treatment.—Intestinal antiseptics should be used, kerol, etc., in small quantities and well diluted, potassium permanganate in the drinking water.

Fowl Cholera.—*Cause.*—This disease, which is also very contagious, is caused by the presence of a rod-shaped germ scientifically called bacillus avisepticus. It is found in the blood and also in the droppings; the food and water become contaminated by the droppings, and the disease becomes apparent in from three to seven days after the germs are introduced into the body.

Symptoms.—Sudden loss of appetite, great thirst (the birds stand around the water vessels), great weakness, reeling gait, staring and unkempt feathers. The birds mope, become listless, emaciated and tremble. The comb darkens in colour, and there is diarrhœa of a very liquid consistency and of a greenish-yellow colour. The head and tail hand down, giving the so-called ball appearance. The birds may live from seven to ten days at the most, and then have convulsions and die.

Post-mortem Appearances.—The liver is very dark in colour; it tears easily and is above the normal size. The intestines are congested, and contain a frothy material; there may also be hæmorrhage in the mucous membrane of these organs. The spleen is large, dark and soft. The kidneys are dark, swollen and soft.

Treatment.—Preventive Measures.—Again isolate those that are affected and kill and burn the worst cases. The houses and all round them should be thoroughly disinfected with a 5 per cent. solution of carbolic acid and warm water. The germs are very resistant, and live a long time outside the body. Put permanganate of potash in all the drinking water, and give ½ grain of the following mixture to each sick

bird three times a day:—Equal parts of sulphocarbolate of calcium, sulphocarbolate of sodium and sulphocarbolate of zinc.

White Diarrhœa.—This is very common, especially in chicks, and is very contagious.

Cause.—It is due to the presence of a rod-shaped germ called bacillus pullorum. The ovaries may be affected, and so the eggs and the chicks may die either in the shell or two or three days after they are hatched; they may live longer and finally recover. Adult birds will become affected by eating food contaminated with the germs. Another cause of the spread of the disease is that eggs, chicks and adult birds containing the germs are often sold, thus distributing the disease among unsuspecting breeders, and from one local centre many foci of disease may result. In America an Inter-state law has been put into force in such cases for the protection of the poultry industry.

Symptoms.—The birds are sleepy and huddle together. The wings droop, there is no appetite, and the feathers are ruffled. In the chicks the yolk sac is not properly absorbed, the abdomen protrudes from behind, and there is a discharge of a brownish-white or white colour, which adheres to the fluff, and the vent is pasted up. The disease is worst in hot weather.

Treatment.—Disinfect the coops, incubators, houses and premises thoroughly. Kill all chicks affected, as they will never make good profitable birds. Give sour separated milk from the start, as the lactic acid in it forms an unfavourable ground for the germs.

Spirochœtosis.—This is of itself not a contagious disease, but as it is caused by the presence of fowl ticks (erroneously called tampans), and as these are unfortunately everywhere and a curse to the poultry industry of the country, it rightly comes into this article.

Cause.—The poultry tick, belonging to the order Acari, genus Argus, is scientifically known as Argus Persicus. It is found in its second, third and adult stages in cracks in the walls of the house, in the perches, etc., and under the bark of trees in the vicinity of the house. At night it emerges and attacks the fowls. In the first stage (larvæ) they remain on the bird ten days and nights, but are so small that they cannot be seen with the naked eye. The tick is the host of an organism called a spirochœte, which, when the blood is being sucked, passes into the system of the fowl, causing the disease.

Symptoms.—Prostration, high temperature, loss of appetite, thirst, ruffled feathers, mopiness, and a slight diarrhœa of a greenish-yellow colour. For full particulars of this disease, refer to the *Rhodesia Agricultural Journal* for February, 1919, or send to the Department of Agriculture for Bulletin No. 314.

The main object of this article is to draw attention to the fact that we have these contagious diseases in the country, and it behoves everyone, especially farmers and poultry keepers, for the welfare of the poultry industry and the increased production of good eggs and fowls, to use every endeavour to combat these diseases, and as far as possible stamp them out of the country. The presence of disease should be immediately notified to the writer of this article at the Department of Agriculture.

Ground Nuts.

(Extracted from the Bulletin of the Imperial Institute, October-December, 1918.)

A marked feature of the agriculture of the Southern United States in recent years is the rapid increase in the cultivation of ground nuts; or, as they are generally known in that country—peanuts.

Ground nuts first became important commercially in the United States in 1870, and gradually increased in importance up to 1900, since when the industry has expanded enormously; in 1889 only 3,588,143 bushels of nuts were produced; the production increased to nearly 12,000,000 bushels in 1911, and to over 40,000,000 bushels in 1917, in which year the area under ground nuts amounted to over 2,000,000 acres.

The development of the industry is due to improvements in machinery for planting, harvesting and handling the nuts, to the recognition of the value of ground nuts as human food and for feeding animals, and to the planting of ground nuts on cotton land infested with the boll-weevil.

Two different types of ground nut are grown; the Virginia type, including the "Virginia bunch," "Virginia runner," "North Carolina," and other varieties; and the Spanish type, including the true Spanish "Georgia red," "Valencia" varieties, etc. Planting is done by a machine which opens a furrow, drops in the nuts and covers them with soil. Great reductions in the cost of growing have been effected by the use of large "cultivators." As ground nuts have to be "cultivated" three to six times during the growing season, it is obvious that a great saving of labour can be effected in this way.

Harvesting was formerly done by pulling the plants by hand or by ploughing followed by removal of adherent earth by hand; now it is done by the large growers by a special harvester similar to a potato-digger, which is capable of harvesting 8 to 12 acres a day. The plants are still stacked by hand to dry, the object being to keep the nuts off the ground and protect them from rain so that the nuts "cure" to a light colour.

Removal of nuts from the plants by hand is tedious, and is being superseded by machine pickers, in which the plants are drawn over a wire mesh; the nuts drop through the meshes and are broken off the plants by rubber brushes attached to moving belts; after removal from the plants the nuts fall on to a grid which retains them but allows earth, etc., to pass through; finally the machine removes the stems of the nuts. These picking machines deal with 200-400 bushels of nuts a day, but are somewhat fragile and are not adapted for treating other crops.

An ordinary threshing machine with a special cylinder and run at slow speed will deal with 400-600 bushels of nuts a day, but it damages the shells of a good many nuts, though this is of no great importance where the nuts are not to be sold in the shell.

From the farm the ground nuts, with the exception of those sold to oil mills, are sent to factories which clean and grade them before sale to manufacturers of roasted nuts or other food products; for the latter purposes the large "Virginia" nuts are roasted in the shell, the lower grade small nuts, *e.g.*, "Spanish" and "African," being mostly shelled before sale. One ton of nuts as they leave the farm produces 1,300-1,400 lbs. of cleaned nuts.

Ground nuts are consumed in enormous quantities in the United States, chiefly in the form of roasted nuts, but also as salted nuts, candy, ground nut butter, and in confectionery and baked products. Ground nut flour made either from the raw or roasted nuts, or from oil-cake, is also coming on the market, and is well suited for use as a partial substitute for wheat flour in making bread, biscuits and other foodstuffs.

The production of ground nut "butter" is already very large and is increasing. No statistics for the total output are available, but three large factories produced over 7,000,000 lbs. in 1916, and one of these factories increased its output by 50 per cent. in 1917; probably over four million bushels of nuts were used for this purpose in 1916. The process of manufacture of ground nut "butter" is comparatively simple and consists in roasting high-grade kernels in a machine similar to a coffee roaster; the roasted kernels are then cooled and "blanched" in machines which brush off the red skins; the kernels are then hand-picked to remove defective kernels and finally ground with the addition of a small amount of salt. Different varieties of nuts are generally blended before grinding with a view to improving the taste and texture of the product.

Up to 1914 ground nut oil was not imported or produced to any considerable extent, but in 1916 over 2,000,000 gallons of the oil were imported, and 3,488,649 gallons were produced in the United States, mostly from unshelled nuts. The consumption of this oil is likely to increase, while the popularity of the oil with manufacturers of lard substitutes, who harden the oil by hydrogenation, is said to be increasing.

The manufacture of ground nut oil in the future will be carried out at cotton seed oil mills, as the machinery is mostly suitable and the supplies of cotton seed are often insufficient to keep these mills fully employed. The local manufacture of oil has proved beneficial to growers of ground nuts, as it gives them a market for low grade nuts.

The ground nut is also of importance as a fodder crop, and as the crop is well suited for feeding pigs, its cultivation for this purpose is likely to increase in the future. It is stated that the ground nuts produced on one acre, when fed to pigs, will yield 400 lbs. of pork, while if the hay is harvested before pigs are turned into the field the hay practically pays for the cost of growing the crop. A further advantage of growing ground nuts as a fodder crop is that nitrogen and humus are supplied to the soil, which, in the ground nut growing districts, is often deficient in these important constituents. Ground nut

hay is superior to grass hay, and about equal in feeding value to clover hay.

As ground nuts withstand drought well, they are suitable for growing in the south-west, where maize cannot be grown advantageously; ground nuts are also said to be valuable on alkaline soils.

The future of this industry in the United States appears to be promising, as the demand for the nuts is increasing rapidly, especially for the manufacture of oil, owing to the general shortage of fats brought about by the war and of cotton seed caused by the ravages of the boll-weevil.

African Coast Fever.

By J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

On 10th May information was received that a number of cattle had died on the farm Clearwater, Hunter's Road siding, Gwelo district, and microscopic examination left no doubt that the cause was African Coast Fever. On further inspection and examination it was found that an intense infection existed and up to the end of the month 214 cases of disease had occurred. Immediately the existence of Coast Fever was determined all movement of cattle to the north of Gwelo was suspended, but subsequently the whole of the native district and a small portion of Selukwe district were placed in quarantine because of the intense infection found to exist at Clearwater.

On 13th May information was received that some 62 oxen had been forwarded about a week previously from Clearwater to Wolf Hill, in the Mazoe district; these were inspected the following day, when it was found that three had already died and a large number were visibly sick. Examination by the thermometer shewed that not more than a dozen were healthy. The whole of the animals were destroyed and three-day dipping instituted on the farms concerned. The trucks in which these animals had travelled were traced and disinfected.

Although there may possibly be some further case of disease on the farms where these cattle were located, it is confidently expected that there will be no spread of infection in the district.

Swine Fever and Swine Erysipelas.

The following descriptions of swine fever and swine erysipelas are taken from Stock Diseases Regulations published by the Union Department of Agriculture.

SWINE FEVER.

Definition.—A contagious eruptive disease now considered to be due to an ultra visible organism, although formerly believed to be caused by bacillus.

Animals affected.—Swine.

Symptoms.—The disease may come on rapidly, especially in young pigs. This is the acute form, which generally ends fatally in about three days. The symptoms are less definite than in chronic cases. The temperature is high— 105° F., or even higher. The breathing is quick; the pigs seem to have lost control over their hindquarters, and stagger if made to walk. A red rash appears on the skin at the base of the tail, under the belly, inside the thighs, and on the ears.

Usually the symptoms come on more slowly. The pigs appear to be dull; they lie under cover and are disinclined to move. The appetite is lost; frequently the animals vomit. Constipation, followed by diarrhœa with blood-stained fæces, is often observed. A mucous discharge may be present around the eyes. Red patches, which later on assume a violet tinge, are observed at the base of the tail, inside the thighs and hocks, under the belly, and on the ears. The temperature is high—104° to 106° F.

The pigs can be roused only with difficulty, and when made to move they stagger about as if inebriated. Very frequently lung symptoms are present. In this case the sick animals suffer from a short cough, and the breathing is very laboured. The animals die in from one week to three. They may, however, drag on for two months or more in an emaciated condition.

Post-mortem.—The carcase is generally emaciated. The discoloured patches on the skin have a livid hue, but this is also seen in other diseases of swine.

In acute cases followed by rapid death the changes are not characteristic, but one's suspicions should be aroused if a number of swine become sick about the same time. In the more chronic cases the most characteristic change—ulceration—is found in the alimentary tract. The ulcers may be present on the tongue, the stomach, or any part of the bowel, but in most cases they are confined to the more posterior por-

tions of the latter, particularly around the junction of the ileum with with the cæcum.

The most typical ulcer is about the size of a threepenny piece. Its edges are circular, and raised above the membrane. The centre of the ulcer is soft, and often yellow or black in colour. The other parts of the bowel may be inflamed, and often the inner surface is covered by a yellowish deposit. Two loops of bowels may have grown together.

The lungs are very often, though not always, solid in patches, and fluid may be present in the chest. The glands are very red in colour in the more acute cases.

SWINE ERYSIPELAS.

Definition.—A contagious disease of swine, caused by the bacillus of swine erysipelas.

Animals affected.—Swine.

Symptoms.—The swine shew the usual signs of severe illness in the pig, viz., rise of temperature, shivering, loss of appetite and vomiting. In acute cases a fatal termination may take place in twenty-four to forty-eight hours, but frequently the animals live much longer. In the less acute cases a red patchy eruption from which the disease gets its name—erysipelas—appears on the buttocks, thighs, body and ears.

The breathing is very quick, and the swine stagger about when made to walk. Ultimately they lie prostrate in the litter and die comatosed.

In mild cases the general symptoms are not marked; the swine appear to be out of sorts, and shew the usual skin eruption.

Animals which have apparently passed through the acute stages of the disease may remain unthrifty for a long time. Sometimes they die suddenly from disease of the heart, which is not an uncommon sequel to the disease.

The skin is discoloured by livid patches as in swine fever.

Post-mortem.—The membranes of the stomach and intestines shew red patches, and are often swollen. The intestinal glands on the membrane are red and enlarged; sometimes the surface over these glands is abraded, but the distinct ulcer of swine fever is never seen.

The lymphatic glands throughout the body are swollen and red. The spleen is often enlarged. The membraneous coverings of the lungs and heart shew red spots, and sometimes water is present in the chest and heart sac. The lungs are congested.

In the chronic form one finds that the tissues around the opening between the chambers of the heart, particularly on the left side, are thickened and rough, that is to say, endocarditis is present.

Co-operative Cattle Sales at Plumtree.

An interesting innovation in the method of selling cattle was initiated in April by the Farmers' Association of Plumtree, when a stock sale was held under the auspices of that body on co-operative lines. The association organised and advertised the sale, employed an auctioneer on its own behalf, charged a low commission, and set the profits against the expenses and costs of the stockyard. It is hoped in this way soon to pay off the outstanding debt in this connection, after which the charges will be reduced, or, being already so moderate, will be devoted to further development of this market and to other objects of public utility for the benefit of those patronising the sales. The Plumtree Farmers' Association is fortunate in owning suitable kraals, a dipping tank, well and watering troughs, facilities quite within the powers of other similar communities to obtain. Plumtree is the centre of an excellent district, and the cattle at this successful sale came from within a radius of only twenty miles. It is one of the advantages of local sales that if prices do not satisfy the seller he can easily take his stock home again; though this was not the case at Plumtree, where good prices obtained, the stock offered being wanted by butchers and breeders alike. The terms were strictly cash before removal of purchases, and the value of the sales for the day exceeded £2,500, a good beginning, which augurs well for the future. Of this amount, the association levied a commission of only 3 per cent., of which one-third remunerated the auctioneer for his day's work and 2 per cent. much more than covered expenses. The sale was economically and efficiently conducted. All animals entered a sale ring, and buyers were not required to wander from pen to pen, nor did the auctioneer perform a hurdle race, as is seen in other sale yards. The cattle passed out one by one through a crush, each being paint-marked gratis, and, if desired, taken in charge and trucked at a low fee.

Natives in the district own very large numbers of cattle, and they attended the sale, thereby gaining a valuable lesson in the value of stock, removing illusions which tend to restrict disposal of their cattle when best saleable.

This was the first sale of the kind ever held at Plumtree, and was opened by Dr. Nobbs, the Director of Agriculture, who in a short speech commended the enterprise of the Plumtree Association and wished well to the venture. As the success was so marked, these hopes are likely to be realised at regular future sales at Plumtree, which has given an example deserving to be copied and emulated by other farmers' associations throughout the country.

Cattle Dipping.

By "Z."

It is to be regretted that even to-day, for some reason or other, many farmers are opposed to the dipping of cattle. I feel sure if these men dipped their cattle systematically for a few years, they would entirely change their opinions. The writer for many years could not be convinced of the beneficial results from running cattle through an arsenical dip. Though fully aware of the tick danger, dipping seemed to my mind a greater danger, although in those days I dreaded the calving season, knowing the heavy death rate amongst calves which usually took place. To-day practical experience has satisfied me that regular dipping on tick-infested veld will practically eliminate all diseases common to young calves.

In a certain district last year the death rate amongst calves where dipping was not practised varied from 30 to 50 per cent., while the death rate in the same district where cattle were systematically dipped was only from 2 to 5 per cent.

It must be remembered that dipping to-day is no longer in the experimental stage. It is a proved and established fact that 75 per cent. of the cattle diseases disappear when war is regularly waged against the tick. To fight and banish the tick, it is essential to dip systematically, and equally important to see the dipping fluid in the tank is always of prescribed strength, in order to get the ticks at their different stages. A campaign carried on in a half-hearted fashion will take a longer period to cleanse a farm, and consequently entail a heavier expenditure.

In areas where game abounds the tick will, of course, always find a host, and it must be clear, even to the meanest intelligence, that in such cases it is impossible to eradicate the tick.

The writer is of the opinion that where dipping has been carried on for a number of years, and ticks are not too numerous, calves under six months old should not be dipped; this will give the young animals a chance of contracting such diseases as redwater and gallsickness in a mild form, thereby becoming immune before being weaned. This is a decided advantage, as there is always the danger of heavy losses through this disease amongst stock born and bred on clean veld if moved on to tick-infested areas.

The Cattle Cleansing Ordinance of 1918 is bringing the farmers more or less into line, and the compulsory observation of its conditions has already shewn good results.

I do not, however, favour the hard and fast rule of weekly dipping where farmers have dipped their cattle for some years, and on whose farms ticks are to all intents and purposes non-existent. Whilst admitting it is the duty of every farmer to keep his stock clean, in such cases where cattle are free from ticks owners should not be compelled to dip weekly, but if the Cattle Inspector should find the stock infested, strong measures should be taken against the *tick breeder*!

The Government standard dipping tank is certainly the best, but where suitable stone is available this material might be substituted for cement, and thus lessen the cost. The exit race should be at least 80 feet long, to drain dip back into the tank.

A cheap and effective cover for a tank is curved corrugated iron, long enough to cover both splash walls, made into six or eight sections and hinged along one side of the wall; these can easily be opened and closed as required. The hinges could be cheaply made from old wagon tyres.

In conclusion, I should like to suggest that the Farmers' Co-operative Society undertake the manufacture of a suitable arsenical cattle dip, and sell it at about or actual cost. At present the excessive price of the various dipping fluids on the market makes it very difficult for many farmers to observe the terms of the Cattle Cleansing Ordinance.

Peanut Recipes.

Peanuts Salted.—One pint whole shelled peanuts, one tablespoonful salt. Take blanched whole peanuts. Dry well, place in flat tin dish; add about an ounce of butter. Set the plate in a moderate oven until the peanuts are a golden brown. Then take them out of oven, add a heaping tablespoonful of salt and turn them in the dish to cool. Pick out peanuts and throw aside the extra salt. When cool, place in a box lined with wax paper, covering tightly. Be careful to turn frequently while they are in the oven, so that they may be equally browned on all sides.

Peanut Brittle.—1 cup brown sugar; 1 cup ribbon cane molasses; 2 tablespoonfuls butter; 1 tablespoonful vinegar; 1 cup roasted peanuts; 1 teaspoonful soda.

Boil together the sugar, molasses, vinegar and butter until a little dropped in cold water is brittle. Add the peanuts, remove from fire, stir in the soda dissolved in a little water, beat until creamy. Pour into greased platters; when cool cut into squares.

Peanut Flour Pudding.—1 cup peanut flour; 2 cups milk; 1 egg; 1 teaspoonful vanilla; 2 teaspoonfuls salt; 2 tablespoonfuls sugar or corn syrup.

Bring to boiling, continue cooking in double boiler 20 to 30 minutes. Serve with custard, fruit or chocolate sauce.

Baked Peanuts.—Shell unroasted peanuts, pour boiling water over them, letting them stand until the skins are easily removed. Place a pint of these in a bean pot with two quarts of water, season with salt and paprika, cover and bake slowly until soft and mealy, which will require about eight hours. Peanuts chopped or peanut butter used with rice adds the needed fat to make a well-balanced dish.

Peanut Cookies.—3 tablespoonfuls shortening; $\frac{1}{2}$ cup sugar; 1 egg; $\frac{1}{4}$ teaspoon salt; $\frac{3}{4}$ cup peanuts, roasted and chopped; 1 cup flour; 2 tablespoonfuls milk; $\frac{1}{2}$ teaspoon soda; juice $\frac{1}{2}$ lemon or 1 tablespoonful vinegar; cream shortening and sugar and add beaten egg.

Sift the flour, salt and soda, and add to other ingredients. Then add milk, peanuts and lemon juice. Drop from teaspoon on buttered pans one inch apart and place a half peanut on each. Bake in a slow oven. This will make about two dozen cookies.

Peanut Fondu.—1 cup finely-ground peanuts; 1 cup dried Liberty-bread crumbs; 1 egg; $1\frac{2}{3}$ cups milk; $1\frac{1}{2}$ teaspoons salt; dash of paprika.

Grind the peanuts fine. Mix all the ingredients except the white of egg. Beat egg white very stiff and fold in. Bake in a buttered baking dish for 30 to 40 minutes in a moderate oven.

Peanut Irish Stew.—Slice thin six large onions and cut in cubes an equal measure of uncooked potatoes; cook until the potatoes are half done; then add half a cupful of finely-chopped roasted peanuts and cook until the vegetables are tender. When ready to serve add half a cupful of peanuts cut in halves.

Devilled Peanuts.—Blanch and chop two tablespoonfuls of peanuts and fry brown in two tablespoonfuls of fat. Mix together one tablespoonful each of chutney and Worcestershire sauce, two small pickled cucumbers, chopped, and salt and pepper to taste. Add to the peanuts, then spread on small squares of hot buttered toast or fried bits of bread.—(From *The Peanut Promoter*, Houston, Texas.)

Correspondence

EXPORT OF DRIED MEAT.

To the Editor,

Rhodesia Agricultural Journal.

Sir,

I shall be obliged if you will find space in an early issue of your *Journal* for the following enquiry, which has been received by this Committee through the Acting Trade Commissioner for the Union of South Africa in London from a Manchester (England) firm :—

> "Being desirous of commencing an import trade in dried meat from South Africa (for which I have a market), I should be glad if you could give me the addresses of owners of large cattle ranches to whom I could write for samples, sending them my formula under which I want it prepared. Dried meat is to replace at a lower price the canned and refrigerated article. I wish to get in touch with the up-country rancher, in order to save the heavy cost of carriage on live stock to the coast. I want to be in touch with inland firms where cattle are cheap, hence my asking for names in Rhodesia. I am also desirous of getting in touch with large up-country farmers, or any person or firm in a position to produce and ship dried eggs at a low price."

This Committee will be pleased to forward the names of cattle owners or others interested to the enquirer, or, if preferred, send that gentleman's name and address to any applicant.

Yours faithfully,

RHODESIA RESOURCES COMMITTEE.

12th May 1919.

P.O. Box 4, Bulawayo.

FIRE GUARDS.

To the Editor,

Rhodesia Agricultural Journal.

Sir,

I have been requested by the association to forward to you a short descriptive article on the system operating in this district for the prevention of veld fires and the detection of their origin.

Through the association all farmers in the district are invited to subscribe according to their ability. The amount required is about £25. This covers the expense of four fire guard natives, including rations. A small committee is formed, the co-operation of the police secured, and at a joint meeting the district is divided into, say, six patrols of four or five farms, or roughly 24,000 acres, and all particulars arranged.

The police engage four special fire guard natives, who receive from us 25s. per month and food. Two native constables are supplied by the police and placed in charge, and they also each take up a patrol. All six are provided with books from the camp, and as they go their rounds the book is signed by each farmer, and time and date entered. When the books are inspected it is thus easily discernible if these patrols have been doing their duty. It is understood that the men are entirely under the direction of the police. The native constables draw their pay and rations from the camp, and the special fire guard boys receive theirs from a farmer chosen in each patrol.

We employ the guard for four months, from July to October, and farmers are then free to burn veld with the first rains if they so desire.

The system has proved satisfactory. When a guard boy detects a fire, he makes for the spot, and is authorised to call out all the natives in the vicinity; thus he gets the fire under. He then endeavours to discover the origin, and obtain what evidence he can, and reports to camp accordingly. It seems so far the only effective way of impressing on the native mind that he must not in any way cause a veld fire, and we have found that when natives have wished to burn stalks and chaff in their own lands, they have first obtained permission from the farmer.

In the month of July, 1917, we had seven very serious fires prior to the guards going on duty. During August not a single fire was reported in the whole district. There is no doubt that the veld of the district has been saved during the years that the fire guards have been employed.

Yours, etc.,

W. H. ROBERTSON,
Hon. Sec.,
Rhodesian Landowners and Farmers' Association,
Figtree Branch.

[We publish this interesting and informative contribution on veld fires with much pleasure. No doubt it will suggest the possibility of similar measures elsewhere. We might in this connection remind farmers that under the Herbage Preservation Ordinance, 1913, it is competent for the Administrator to prescribe, on the petition of an actual majority of owners and occupiers representing not less than two-thirds of the land in such areas, that any owner or occupier may require his neighbours to join with him in creating fire guards not less than five yards wide on each side of the boundary. This provision of the law is not so widely known as it deserves to be, and has so far only been adopted in one portion of the Salisbury district.—Ed., *R.A.J.*]

OBSTRUCTION IN THE SHEATH OF THE OX.

In connection with the article which appeared in the February number of the *Journal* dealing with the above-mentioned subject, the Chief Veterinary Surgeon has received a letter from a stock-owner of

considerable experience in this country tendering the opinion that the injury in question is very largely due to misuse of the whip. In support of this statement, he instances the case of a native driver, who, having allowed the reim of his whip to drag in the mud, applies it so that it will curl "nicely" round the back and belly of the beast selected for chastisement, in this way causing the injury referred to. The remedy suggested by the correspondent is to see that the stock of the whip is as long as can be procured, and the reim either 3 feet or 8 feet in length, the contention being that the former is not long enough to permit the native to wield the whip in such a way as to cause injury to the oxen, and the latter the reverse.

The Chief Veterinary Surgeon expresses the opinion that the condition referred to could easily be set up by injury caused by the whip.

The Agricultural Outlook.

Reports from the various districts of the Territory go to shew that the season has been a good one, and that crops have generally done well. The maize harvest will most probably be a record one, and arrangements are now being made to export supplies in excess of local requirements. The early frosts caused a certain amount of damage to the tobacco crop in some districts, but on the whole good yields are recorded, and the quality of the leaf is good.

Cattle generally are healthy and in good condition. Pasturage in most parts of both provinces is excellent, and there is every prospect of stock wintering well. In the Hartley district the position is not so favourable, for, owing to the very light rainfall since the end of February, the veld has rapidly dried up, and grass fires have commenced in different localities. The unfortunate outbreaks of African Coast Fever at Hunter's Road and Mazoe and the spread of quarter-evil in Mashonaland are disturbing factors; but the Veterinary Department is taking vigorous action, and it is to be hoped the incidence of disease in each instance will be localised. The canning factory at Odzi is well on towards completion, and it is to be hoped this important addition to the increasing list of local industries will receive the whole-hearted support of cattle owners when it commences operations.

Veterinary Report.

March, 1919.

AFRICAN COAST FEVER.

An outbreak occurred on the farm Mermaids' Grotto in Melsetter district. One animal was destroyed and the disease confirmed by microscopic examination. There have been no further cases on the other infected farms in Melsetter district nor at the Victoria or Mazoe centres.

QUARTER-EVIL.

Further outbreaks have been reported in the Gwelo, Charter, Selukwe and Chilimanzi districts, and 45 deaths reported in Matabeleland.

CONTAGIOUS ABORTION.

A case of this disease was recorded in the Shangani district.

HORSE-SICKNESS.

A few deaths have been reported.

TRYPANOSOMIASIS.

The deaths of thirty-five head of cattle were reported from Wankie district and two from Melsetter district.

CARNIVORA.

One hundred head of cattle were killed by wild dogs and lions in West Nicholson district.

IMPORTATIONS.

February.—From the Union of South Africa: Horses, 63; mules, 22; donkeys, 8; bulls, 19; heifers, 48; calf, 1; sheep and goats, 2,032.

March.—From the Union of South Africa: Horses, 45; mules, 41; donkeys, 6; bulls, 1; heifers, 8; sheep and goats, 2,838. From the United Kingdom: Heifer, 1; calf, 1.

EXPORTATIONS.

February.—To Union of South Africa: Slaughter cattle *via* Bulawayo, 1,153; *via* Liebig's Drift, 46. To Congo: Pigs, 30; sheep and goats, 105.

March.—To Union of South Africa: Slaughter cattle *via* Bulawayo, 454; *via* Liebig's Drift, 49. To Northern Rhodesia: Donkeys, 20. To Congo: Pigs, 90; sheep and goats, 385. Slaughter cattle to Portuguese East Africa, 177.

April, 1919.

AFRICAN COAST FEVER.

No cases have occurred at any of the infected centres.

QUARTER-EVIL.

Numerous outbreaks occurred in the Midland districts.

HORSE-SICKNESS.

Deaths reported:—Victoria, 4; Mrewa, 6; Hartley, 2; Umtali, 10; Bulawayo and Plumtree, 9; Gwanda, 7; Insiza, 1.

CONTAGIOUS ABORTION.

Another herd infected in Salisbury district.

TUBERCULOSIS.

One case was reported in an animal slaughtered at Johannesburg abattoirs.

TSETSE FLY.

Cattle are still reported dying in the Malindi area—75 deaths reported to date.

IMPORTATIONS.

From Union of South Africa:—Bulls, 110; heifers, 67; horses, 21; mules, 10; donkeys, 18; sheep and goats, 2,313.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo, 534; *via* Liebig's Drift, 843; other stock—mules, 6; pigs, 18; sheep and goats, 400. To Portuguese East Africa—slaughter cattle, 71.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

June.

BEE-KEEPING.

At this season hives require to be painted; the woodwork, being exceedingly dry, is in good condition to receive it. Linseed oil (unboiled) is the best kind to mix with white lead, as it is more penetrating, acting as a better preservative than boiled oil. Bees will be able to take beneficial flights during warm days, so that dysentery need not be anticipated.

CITRUS FRUITS.

Cultivation of the grove is to be continued and pruning taken in hand towards the end of the month. Washington Navel oranges and some earlier varieties will be ready this month for gathering, packing and despatch.

CROPS.

The harvesting of the smaller crops will now be over, except possibly pea-nuts, mangels and dhal. Pea-nuts should be lifted before the first frosts if possible. Mangels may safely be allowed to remain in the ground until required for use; or, if harvested, should not be heaped, but spread thinly on the ground at a convenient spot. Dhal will not be ripe until the end of the month, when the plants should be cut about a foot above the ground, allowed to dry for a few days, then shaken to free the seeds from the pods. Ploughing should be continued through the month if possible, and, if the maize is cut and stooked on the side of the lands, the maize fields should be ploughed to keep down such pests as the stalk borer. Winter crops of wheat, oats and barley will not require much attention. As a rule, where water is plentiful, too much irrigation is practised. One application per month will generally be found sufficient for the above crops.

DAIRYING.

With the advent of the winter months, dairy produce is not so liable to perish as in the hotter months. Cream producers can with advantage produce cream for the factories containing a slightly lower fat percentage, as cream is not so likely to go sour on account of lower atmospheric temperatures. With regard to next season's milk or cream supply, dairy farmers must ensure that the dairy cows are kept in good condition throughout the winter months, so that they can produce milk immediately after calving, and not require the first two months' fresh grass to bring them into condition, thereby losing what should be the best weeks of their production. A cow gives her utmost in milk from four to six weeks after calving, but she must be in good condition to do this.

DECIDUOUS FRUITS.

Pruning of deciduous trees should be done this month or in July.

ENTOMOLOGICAL.

Cabbage Family.—Plants of this family suffer from cabbage louse and Bagrada bug during June.

Onions.—Suffer from thrip. The transplants may be dipped as far as the roots in tobacco wash or paraffin emulsion to keep down the pest.

Fig.—The winter crop of fruit is liable to suffer from fig weevil. The infested fruit should be collected and destroyed. If this has been done regularly with the first crop, the second crop is not likely to suffer much.

FLOWER GARDEN.

Annuals for early spring flowering should be sown, preferably in boxes in a warm place sheltered from the wind. Perennials, shrubs and ornamental tree seeds may also be sown. Fruit trees, shrubs and roses should be pruned and all dead wood removed. Sweet peas require constant attention.

FORESTRY.

Burn out the grass in any fire traps round or near the plantation that were left unploughed. Any timber that is to be felled should be taken in hand this month.

GENERAL.

Grazing in drier districts is beginning to give out, and steps should now be taken to ensure that some good veld in the neighbourhood of the water is preserved for future use. It is a mistake, frequently seen, for all the grazing nearest to the drinking places to be first consumed, so that later on the cattle, when least able to endure fatigue and when the grass is in any case most scanty and dry, have furthest to walk from the feeding ground to water. A little forethought can obviate this trouble. Live stock are usually in good condition at this time of year and able to travel longer distances to water than may be the case later on in the season. Fire guards to prevent grass fires should be looked to.

POULTRY.

During the sudden cold snap in May many poultry keepers complained of sudden cessation of eggs; this always happens during a cold spell and can be remedied by keeping the birds warmer at night. Houses open on one side only (the front), and all must be provided with a canvas blind (old sacks sewn together will do) which can be let down as soon as the sun sets on cold nights, thus keeping the birds snug and warm during the night; no food which previously went to produce eggs is thus required to maintain the body heat. Those who study this point during cold weather will profit considerably by a continued egg supply. The notes with reference to chickens for the months of April and May are similarly applicable to June and July; avoid overcrowding, keep them growing without any check, with plenty of exercise and fresh air, and your labour will be amply rewarded by good, vigorous, profitable birds later.

This is one of the poultry keeper's busiest periods, but method, cleanliness and attention to details pay him well. Do not leave anything that you can spare the time to do yourself to natives; those who have not much time to spare should see the work is carried out properly. Watch carefully your breeding birds, and on the slightest sign of one going off, take him or her away; if left you will have unfertile eggs, weak germs, weak chicks difficult to rear, and later weak and unprofitable stock. Those who are using incubators should watch the temperature of the room on cold nights, for variations in temperature result in delayed and poor hatches, and often deformed chicks.

STOCK.

Cattle.—There is every indication of a good winter season for horned stock, and ranching cattle should not give much trouble. Dipping is best postponed during very cold snaps until a warm day occurs. Cows with autumn calves should be kept in the more sheltered paddocks. A watchful eye should be kept on all watering places in order to prevent their being fouled or stopped up. Bulls should be kept out of the herd until the end of July at least, and, in the meantime, they should be well fed and cared for in order to fit them for their work. The three watchwords in the dairy herd should be feed, shelter and bedding from now onwards. Ensilage will now be found invaluable, as also will pumpkins, majordas or any other form of succulent food. Good hay should be used to rack up with at night, and the maize ration should be supplemented with ground-nuts, ground-nut cake or bean meal. Young calves are better in the pens on very cold mornings until the sun has gained some power, when they may run on short sweet veld for a few hours. The above remarks with regard to dipping and water supply apply equally to dairy as to ranching herds.

Sheep.—As most vleis are still very wet, sheep are best kept on the high veld for a while longer. If grass seeds are troublesome, a grazing area should be mown. If the rams were put into the flock in May, they should now be removed. Ewes with lambs will benefit by a few handfuls of mealies, and perhaps ensilage. They should be provided with shelter from cold winds.

VEGETABLE GARDEN.

All the available space in the garden should now be thoroughly trenched and manured, the soil being well worked and loosened. Vegetables planted out for winter crops should be well and continuously cultivated, which will help to bring them along quicker and with less watering. Late-bearing tomatoes should be sheltered from the cold winds by a grass shield. Beans should be staked and tied. Beet, radish, carrot, parsnip, turnip, onion, leek, mustard, cress and tomatoes may be planted.

VETERINARY.

Horse-sickness should be practically over now. Redwater and gall-sickness occur all the year round, but the worst time is the summer, when ticks are prevalent. Blue tongue should be very little in evidence now. After twelve months in this Territory, sheep do not contract the disease. Inoculation can be carried out now. Scab is a poverty winter disease.

WEATHER.

Casual rains may occur, but except on the eastern frontier, none is to be reckoned upon, nor can it be regarded as seasonable or desirable. Frosts generally occur on a few nights during the month of June, and precautions must therefore be taken. This month and the next are the coldest of the year, and when the cold is accompanied by dull weather or "Scotch mist," known locally as "guti," it is apt to have a severe effect on live stock, especially if grazing should at the same time be scarce and water supplies far to travel to.

July.

BEE-KEEPING.

The warmer bees are kept during this month so much the stronger will they come out in the spring. Provide a thickness of 3 inches of cloth coverings over the frames, and where quilts are, on examination, found to be damp, replace them with dry ones. This is a favourable season to carry out repairs to hives. All section and shallow frame combs must be carefully stored away from ants and mice, as these will be wanted for the excellent honey to be stored in them next October, collected from the bush bloom.

CITRUS FRUITS.

Orange trees should be pruned this month, if this work is not completed. Groves must be well cultivated, especially after irrigation has taken place, and the soil round the trees hoed or dug over. Washington Navels will be gathered and some later varieties will be ready for picking. The irrigation of orange trees should be taken in hand when the trees are ready to commence the next growth.

CROPS.

See June.

DAIRYING.

See June.

DECIDUOUS FRUITS.

Pruning may be done this month.

ENTOMOLOGICAL.

Onions.—Thrip is liable to affect this crop, and when present calls for careful attention. Tobacco wash or paraffin emulsion should be used.

Deciduous Fruits.—Scale infested trees may receive a winter wash during this month. Lime sulphur salt wash or scalecide is recommended for this purpose.

Guava.—Citrus growers should always bear in mind that this fruit harbours citrus codling when there is no citrus fruit available. All guava trees, therefore, in the vicinity of citrus orchards should be stripped during this or next month, and the fruit buried deeply or burnt.

Fig.—Fig weevil may still be in evidence. The fruit is also sometimes attacked by citrus codling and other moths. The destruction of infested fruit is the most practical remedy for the pests.

FLOWER GARDEN.

Seeds of most annuals, perennials, shrubs and ornamental trees may be sown. Pruning, if not already done, should be attended to early. Dahlias and other summer-flowering bulbs should be taken up and stored for division and replanting whilst the soil is being prepared. Sweet peas require attention and staking.

FORESTRY.

Cuttings of all ornamental shrubs, roses, etc., should be taken now before the spring growth starts. Plants grown in tins during the previous season should be re-potted as soon as the cold weather is over.

GENERAL.

Veld fires are now liable to occur, and must be watched for and arrangements made to combat them. The loss that may result and the penalties under the Herbage Preservation Ordinance are to be borne in mind. Fire guards should this month be burnt round all grazing which it is desired to preserve for use later on.

POULTRY.

We shall continue to have cold nights this month also; therefore, to keep the birds laying, warmth at night is necessary, and measures as given for June should still be adopted. Remember that a bird will go off laying if not attended to properly, much more quickly than it is possible to get her laying again.

Continue to watch the chicks, keep them growing without any check, and above all, do not overcrowd at night; a little extra care given to them will amply repay you later, with strong, healthy, vigorous, profitable stock.

No eggs should be hatched after August; such chicks take much longer to develop and are usually weedy and very unprofitable; therefore hatch as many as you can this month and the next; the early hatched cockerels that do not shew good qualities should by this time have been killed or sent to market *for killing*, and thus more room, time and food will be available for the pullets and profitable cockerels.

Do not forget that deep litter in which all grain should be buried to induce scratching exercise is absolutely necessary to produce strong, healthy, profitable chicks and adult birds. This is a point that most poultry keepers omit, with most unprofitable and often fatal results, for the birds become lazy and very fat, and a fat bird lays many less eggs than one in good, hard, lean condition; the eggs she does lay are more unfertile, chicks are weaker, and she is also more liable to liver disease and apoplexy. A bird cannot be given too much scratching exercise.

Turkeys should be laying well now; set every egg produced, and for rearing and care of turkeys, refer to the April issue of the *Journal.*

Hatch too as many ducklings as possible before the hot weather commences; they are more difficult to rear in such weather, and the hot sun is fatal to them. If you want duck eggs, go in for the Indian Runner; if eggs and meat, the Pekin; if table ducks only, the Aylesbury; and remember that breeding ducks *must* have water for swimming, if the eggs are to be strongly fertile. Ducklings reared for killing should be kept quiet in a small run, and no water except for drinking purposes.

STOCK.

Cattle.—On ranches the advice given for June applies still. The bulls may again be put into the herd at the end of the month. If grazing has been reserved for the winter months, it will probably be wise to turn the cattle into it now. Watch for any unthrifty cattle, and get them into the home paddock and feed them before they become really poor. Dairy cattle will require heavy feeding now, and if plenty of roughage is available, cows in milk will do better if kept in for a while on cold mornings and turned out only after the warmth of the sun is felt.

Sheep.—Vleis should now be fairly dry and may be utilised; otherwise the advice given for June applies.

VEGETABLE GARDEN.

Sow turnips, beans, peas, onions, cabbage, beet, carrots, parsnips, radishes, lettuce and spinach.

VETERINARY.

Horse-sickness and blue tongue should now have disappeared. Redwater and gallsickness occur all the year round, but the worst time is during the summer, when ticks are prevalent. Sheep may be inoculated against blue tongue now. Scab in sheep will probably be in evidence this month.

WEATHER.

Though rains have fallen during every month of the year in Rhodesia, none are looked for or desired this month. Most stations record an average of .01 to .3 inch over a number of years. Severe cold is likely to occur at this time of year, the lowest temperatures occurring an hour or two before sunrise. Frosts may be looked for, especially on calm clear nights. Cold windy days and damp "guti" weather tell severely on cattle, if shelter and food are not provided.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY.

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1919	March	8·12	0·32	0·07	0·26
1919	April	8·03	0·35	0·13	0·27

TEMPERATURES.

Station	March		April	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	82·5	47·0	84·1	44·8
Hartley—				
Franceys Farm	83·8	56·1	—	—
Gatooma	88·4	59·8	88·0	56·6
Hartley Gaol	84·8	59·0	85·0	58·8
Lomagundi—				
Eldorado Mine	—	—	—	—
Sinoia	86·2	73·1	88·8	69·8
Sipolilo	83·1	42 8	84·4	41·3
Mazoe—				
Mazoe Dam	82·3	47·8	80·5	42·5
Shamva Mine	66·2	62·5	—	57·8
Melsetter—				
Melsetter	75·7	55·2	77·8	53·2
Mount Selinda	79·2	59·0	79·8	58·3
Vermont	79·6	59·1	81·1	59·3
Salisbury—				
Botanical Experiment Station...	79·3	56·2	—	—
Chishawasha	82·3	58·2	81·4	56·1
Salisbury Gaol	81·6	55 9	82·3	53·1
Umtali—				
Public School	—	—	—	—
Victoria—				
Eythorne	83·0	55·0	88·2	52·4
Morgenster	—	—	—	—
Victoria	79·2	56·8	80·3	54·0

TEMPERATURES—*(Continued)*.

Station	March Mean Max.	March Mean Min.	April Mean Max.	April Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	80·1	58·3	81·2	54·5
Garth	79·4	65·6	84·2	60·6
Plumtree School	84·5	58·6	80·3	56·6
Retreat...	93·0	58·3	93·2	54·2
Riverbank	85·3	57·9	84·5	54·0
Bulawayo—				
Observatory	78·6	57·0	79·8	54·3
Gwanda—				
Antelope Mine	83·3	64·4	82·5	62·5
Mazunga	89·1	61·1	—	—
Tuli	91·1	69·1	93·6	69·5
Gwelo—				
Gwelo Gaol	81·7	51·8	82·9	49·8
Matobo—				
Holly's Hope	84·9	58·5	86·4	54·8
Rhodes Matopo Park ...	84·7	55·6	83·2	52·6
Umzingwane—				
Essexvale	81·3	56·5	—	—
Hope Fountain	78·6	55·6	—	—
Wankie—				
Guyo	84·1	58·5	89·9	53·2
Victoria Falls	87·4	67·0	86·5	64·0
Wankie Hospital	90·2	66·2	92·8	63·1

RAINFALL.

Station	March	April	Seasonal to date.
MASHONALAND—			
Charter—			
Buhera	0·41	0·30	30·86
Bushy Park	1·56	—	—
Enkeldoorn Gaol	0·90	0·06	26·00
Marshbrook	3·12	0·04	28 05
Range	1·05	0·27	30·62
Riversdale	1·35	...	34·41
Umniati	0·80	...	28·75
Vrede	1·80	...	—
Wylde Grove	0·69	0·17	25·39
Chibi—			
Chibi	0·56	0·42	20·58
Lundy River	0·58	—	—
M'Rumi	—	0·26	—
Nuanetsi Ranche	0·53	...	16·60

RAINFALL—*(Continued).*

Station		March	Apri	Seasonal to date.
MASHONALAND—(Continued)				
Chilimanzi—				
Central Estates ...	...	0·80	0·49	31·43
Chilimanzi ...	...	1·78	...	21·06
Driefontein ...	...	2·04	0·16	25·56
Felixburg (n.s.) ...	...	1·53	0·20	15·13
Induna Farm ...	...	2·36	0·34	32·94
Orton's Drift ...	...	—	—	—
Umvuma (Railway) ...	...	1·37	—	—
Darwin—				
Mount Darwin ...	...	0·44	0·40	35·88
Gutu—				
Chingombe ...	...	—	—	—
Eagle's Nest Ranche ...	...	0·80	—	—
Gokomere ...	...	1·65	0·14	24·52
Gutu ...	...	2·36	0·47	31·93
M'vimvi Ranche (n.s.)	...	0·38	0·23	29·12
Noeldale ...	...	1·40	0·10	—
Hartley—				
Ardgowan ...	...	1·10	...	26·22
Battlefields (Railway)	...	0·20	—	—
Beatrice (B.S.A.P.) (n.s.)	...	1·14	0·05	25·58
Cringleford (n.s.) ...	...	2·20	0·28	36·03
Elvington ...	...	1·74	0·03	34·38
Franceys Farm ...	...	2·35	—	—
Gadzema (Railway) ...	...	2·00	—	—
Gatooma ...	...	1·52	0·08	32·73
Gatooma (Railway) ...	...	1·09	0·10	30·61
Gowerlands ...	...	0·55	0·97	26·27
Hallingbury ...	...	0·59	0·32	34·28
Hartley Gaol ...	...	1·89	2·32	38·65
Hartley (Railway) ...	...	1·17	—	—
Hopewell ...	...	2·16	—	—
Makwiro (Railway) ...	...	1·65	—	—
Ranwick (n.s.) ...	...	1·07	...	29·25
Shagari (Chevy Chase)	...	2·09	0·15	26·18
Spitzkop	...	1·66	—	—
Inyanga—				
Inyanga	...	0·14	0·50	44·26
Inyanga Settlement ...	...	0·20	—	—
Rhodes Estate ...	...	0·13	0·33	40·49
St. Trias' Hill ...	...	...	—	—
York Farm ...	...	0·39	0·35	46·59
Lomagundi—				
Argyle ...	...	2·26	1·50	35·08
Banket Junction (Railway)	...	0·78	—	—
Darwendale ...	...	1·42	—	—
Duxbury Farm ...	...	2·86	1·09	29·42
Eldorado Mine ...	...	0·69	—	—
Eldorado (Railway) ...	...	0·69	—	—
Gambuli (Mukore) ...	...	1·27	1·78	39·69
Lone Cow Estate	...	1·27	—	—
Longmead ...	...	1·54	0·97	29 02
Maningwa ...	...	—	—	—
Mukwe River Ranche...	...	0·86	0·16	31·99

RAINFALL—(*Continued*).

Station	March	April	Seasonal to date.
MASHONALAND—(Continued)			
Lomagundi—continued			
Palm Tree Farm	3·23	0·65	27·93
Sinoia	0·82	1·58	29·81
Sinoia (Railway)	0·80	1·32	26·30
Sipolilo	1·42	1·01	32·63
Umvukwe Ranche	1·50	—	—
Makoni—			
Carlow Farm	...	—	—
Chimbi Source	0·69	0·80	—
Craigendoran (n.s.)	1·13	0·81	35·21
Delta	1·35	0·26	37·92
Eagle's Nest Ranche	0·30	0·38	32·12
Forest Hill (n.s.)	0·62	0·31	38·14
Gorubi Springs	1·92	0·43	37·41
Headlands (Railway)	0·25	—	—
Mona	0·48	0·10	31·44
Monte Cassino Mission ...	3·67	1·06	53·80
Odzi (Railway)	1·10	—	—
Rusape	1·20	—	—
Rusape (Railway)	1·27	—	—
Springs	1·30	...	35·81
Marandellas—			
Bonongwe...	2·15	0·07	32·09
Huish Estate	1·80	0·13	33·32
Land Settlement Farm ...	1·56	—	—
Macheke (Railway)	0·51	—	—
Marandellas	0·81	—	—
Marandellas (Railway) ...	0·67	—	—
Nelson	1·96	0·07	32·36
Selous Nek	0·24	—	—
Theydon Farm	—	—	—
Tweedjan	1·77	...	29·00
Verdoy	—	—	—
Mazoe—			
Avonduur	1·07	1·40	40·16
Bindura	0·22	0·45	39·01
Bindura (Railway)	0·28	0·58	38·40
Ceres	1·23	1·65	41·76
Chipoli	0·02	0·91	40·06
Citrus Estate	1·24	1·21	34·05
Concession (Railway)	1·41	0·83	35·74
Craigengower	1·25	0·98	38·24
Dunmaglas	—	—	—
Glendale (Railway)	0·88	—	—
Kilmer	1·39	0·92	36·97
Kingston	0·47	0·54	35·91
Laguaha	0·03	0·66	32·44
Lowdale	1·24	—	—
Mazoe	—	—	—
Mazoe Dam (n.s.)	1·02	1·57	42·24
Mguta Valley	2·25	—	—
Omeath	1·75	—	—
Ruia	1·21	—	—
Ruoko Ranche	2·09	1·84	31·37

RAINFALL *(Continued)*.

Station	March	April	Seasonal to date.
MASHONALAND—(Continued)			
Mazoe—continued			
Shamva	0·09	1·21	47·96
,, Mine	0·16	0·53	40·65
Stanley Kop	1·14	2·34	35·04
Sunnyside	1·54	1·14	40·42
Teign	1·53	1·20	44·89
Virginia	1·07	—	—
Volynia Ranche	2·14	1·18	39·38
Melsetter—			
Brackenburg	1·75	1·37	41·65
Chikore	0·60	2·12	34·76
Chipinga	0·50	0·76	33·11
Helvetia	0·80	0·98	47·58
Melsetter	1·16	0·58	23·69
Mount Selinda	1·06	1·58	46·85
Mutambara Mission	0·18	1·45	27·51
Pasture	—	—	—
Tom's Hope	1·05	0·95	46·52
Vermont	1·69	1·27	49·43
Mrewa—			
Glen Somerset	0·79	1·31	32·60
Mrewa	0·49	—	—
Mtoko—			
Makaha	0·18	1·01	37·90
Mtoko	0·75	1·18	31·93
Ndanga—			
Bikita	0·83	1·82	45·69
Chiredzi Ranche	—	—	—
Marah Ranche	1·83	—	—
Ndanga	1·23	0·86	30·67
Salisbury—			
Ardbennie	0·95	1·14	31·95
Avondale	1·41	0·75	36·38
Borrowdale (Hatcliffe) ...	0·95	0·57	32·44
Botanical Experiment Station ...	1·72	—	—
Bromley	0·52	0·80	37·52
Brookmead	—	—	—
Chishawasha	1·90	0·97	36·68
Cleveland Reservoir ...	1·61	0·87	33·10
Ewanrigg	—	—	—
Forest Nursery	—	—	—
Glenara	1·07	—	—
Goromonzi	1·63	1·01	48·10
Gwebi	1·05	0·75	37·37
Hillside	1·72	1·35	32·91
Lilfordia	1·09	—	—
Meadows (The)	1·87	1·08	42·26
Salisbury (Gaol)	0·89	1·16	34·46
,, (Railway)	1·21	—	
Sebastopol	0·82	—	—
Selby	—	—	—
Stapleford	1·62	—	—
Sunnyside	1·22	0·31	38·74
Vainona	1·23	0·51	35·94
Westridge	1·30	0·84	36·88

RAINFALL *(Continued)*.

Station	March	April	Seasonal to date.
MASHONALAND—(Continued)			
Umtali—			
Chiconga	1·41	0·31	—
Hoboken	2·20	—	—
Muromo Ranche	0·21	—	—
Odzani	—	0·42	—
Penhalonga	1·65	0·81	51·78
Premier Estate	1·36	0·21	32·39
Public School	—	—	—
Reservoir (n.s.)	—	0·49	—
Sarum	1·62	—	—
Stapleford (n.s.)	2·67	0·75	76·63
St. Augustine's Mission (n.s.) ...	9·75	—	—
Stralsrund	0·79	...	28·69
Umtali (Railway)	0·53	—	—
Utopia	0·48	0·15	27·51
Victoria—			
Brucehame	0·68	0·23	20·87
Clipsham	1·37	0·13	23·77
Empress Mine	—	—	—
Eythorne	0·91	0·80	25·01
Fort Victoria (Railway) ...	1·22	—	—
Jichidza Mission (n.s.) ...	0·77	1·08	33·28
Makorsi River Ranche ...	0·87	0·62	25·43
Morgenster Mission	—	—	—
Silver Oaks	0·76	0·28	17·80
Summerton (n.s.)	1·82	0·09	22·60
Victoria	1·25	0·25	16·78
MATABELELAND:			
Belingwe—			
Bickwell (n.s.)	1·03	0·34	18·80
Tamba	0·28	0·23	17·32
Wedza	0·61	0·18	21·94
Bubi—			
Bembesi (Railway)	0·48	—	—
Imbesu Kraal	0·98	0·25	29·19
Inyati	0·58	—	—
Maxim Hill	0·32	—	—
Shangani Estates	1·28	...	24·41
Bulalima-Mangwe—			
Empandeni	1·07	0·50	33·00
Figtree (n.s.)	0·55	1·16	22·57
Garth	0·15	0·56	29·86
Holdstock	0·06	—	—
Maholi	0·20	0·50	39·06
Plumtree Public School ...	0·08	2·73	29·05
Retreat	0·70	...	22·65
Riverbank Farm	1·80	0·53	24·73
Solusi Mission	0·83	0·58	28·72
Tjankwa	0·28	1·17	29·48
Tjompanie	0·64	0·48	28·50
Bulawayo—			
Keendale	1·20	0·09	19·70
Khami	0·86	0·30	23·31

RAINFALL *(Continued)*.

Station	March	April	Seasonal to date.
MATABELELAND—(Continued)			
Bulawayo—continued			
Lower Rangemore	1·67	0·26	27·52
Observatory	1·13	0·77	25·22
Raylton (Railway)	0·22	0·14	22·72
Saw Mills (Railway)	...	—	—
Umgusa	—	—	—
Gwanda—			
Antelope Mine	0·93	0·38	25·95
Gwanda (Gaol)	0·67	0·42	22·25
Gwanda (Railway)	0·67	—	—
Lamulas	0·25	0·06	19·03
Langalanga	0·25	...	20·76
Mahalali	0·25	0·43	16·82
Manantji	0·30	0·14	11·86
Mazunga	0·35	—	—
Mapande	0·06	...	22·28
Mrandas	0·93	0·32	28·21
Mtshabezi Mission	0·89	0·62	19·33
Mwanezi (n.s.)	0·55	0·10	18·89
Sovelele	1·07	0·13	24·41
Tuli	...	0·03	16·74
West Nicholson (Railway) ...	0·62	—	—
Gwelo—			
Daisyfield	3·60	...	26·01
Dawn	1·09	1·70	34·31
Globe and Phœnix Mine ...	0·32	...	30·10
Globe and Phœnix (Railway) ...	0·27	—	—
Gwelo (Gaol)	0·75	0·08	28·51
Gwelo (Railway)	1·04	—	—
Hunter's Road	0·49	—	—
Lalapanzi (Railway)	0·86	—	—
Lovers' Walk	—	—	—
Lower Gwelo (Somerset Estate) ...	—	—	—
Oaklands	2·42	0·24	34·70
Rhodesdale Ranche	0·91	0·10	26·41
Rio (n.s.)	2·17	0·22	32·35
Riverdale (n.s.)	0·59	0·06	22·93
Sikombela Farm	0·90	0·11	30·17
Woodendhove	0·98	—	—
Insiza—			
Albany	2·07	...	24·17
Filabusi	1·53	0·40	21·90
Fort Rixon	—	—	—
Infiningwe	1·10	0·11	25·40
Insiza (Railway)	2·61	—	—
Inyezi Farm	1·21	0·20	20·33
Orangedale	2·23	0·15	30·25
Roodeheuvel	1·71	0·11	29·65
Shangani (Railway)	2·28	—	—
Thornville	2·68	...	24·67
Matobo—			
Holly's Hope	2·19	0·82	34·32
Matopo Mission	0·74	0·58	26·31
Rhodes Matopo Park ...	0·18	...	27·75

RAINFALL (*Continued*).

Station		March	April	Seasonal to date.
Matabeleland—(Continued)				
Nyamandhlovu—				
Edwalemi ...	... ...	1·07	—	—
Impondemi	... ...	0·63	—	
Kalaka (n.s.)	... ...	1·89	0·91	—
Melinakanda Junction	...	—	—	—
Naseby Farm	... ...	0·98	0·37	24·16
Nyamandhlovu (Railway)	...	0·40	—	
Sebungwe—				
Gokwe	... ...	1·00	0·06	32·95
Inyoka	... ...	1·88	—	
Selukwe—				
Hillingdon	... ...	1·23	0 37	34·48
Selukwe (Railway)	... ...	1·98	0·57	39·68
Umzingwane—				
Balla Balla (Railway)	...	2·03	—	
Crombie's Hotel	... ...	—	—	—
Essexvale	... ...	1·45	—	—
Heany Junction (Railway)	...	0·25	—	—
Hope Fountain	... ...	0·35		—
Ntabenende	... ...	2·10	0·72	36·39
Springs Farm	... ...	1·31	0·10	28·57
Wankie—				
Dett (Railway)	... ...	1·10	—	—
Guyo	... ...	0·64	...	27·61
Lynwood Estate	... ...	3·75	—	—
Matetsi (Railway)	... ...	0·58	—	—
Ngamo (Railway)	... ...	1·69	0·57	26·37
Victoria Falls	... ...	0·47	...	33·32
Victoria Falls (Railway)	..	1·03	...	35·77
Wankie Hospital	... ...	1·60	0·20	25·17
Wankie (Railway)	... ...	1·39	—	—

(n.s.) means new station, and records not in existence for whole season.
... means nil.
— means no return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1919 June	1919 July	1919 August
Beatrice Road	Various farmhouses	A. V. Johnson	No	fixed dates	
Bembesi	Queen's Mine Hotel	V. C. Andrews	6	4	1
Bindura	Bindura	G. Askew	14	12	9
Bromley	Bromley	C. J. Shirley	5	3	7
Charter—Mgezi	Beatrice Mine	W. Krienke	25	30	27
Central	Umvuma	W. A. James	28	26	30
Eastern Border (South Melsetter)	Helvetia	—	13	11	8
Enterprise	Arcturus Hotel	R. Philip	4	2	6
Felixburg—Gutu	Felixburg	R. H. Brown	..	12	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	7	..	2
Gatooma	Gatooma	T. J. Golding	21	19	16
Gazaland	Chipinga	J. Myers	28	26	30
Greystone	Various farm houses, Shangani	M. Kerr	14	12	9
Hartley	Hartley	W. M. Leggate	27	25	29
Headlands	Headlands	J. Grewar	28	..	30
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	14	12	9
Insiza—Shangani	Shangani	M. E. Weale	7	..	..
Inyanga	Farm Cheshire	F. W. Thiel	28	26	30
Inyazura	Inyazura	H. B. Curling	18	16	20
Iron Mine Hill	Iron Mine Hill	T. Irving	14	12	9
Lalapansi	Lalapansi	B. J. Ingle	21	19	16
Lomagundi	Sinoia	A. H. Layard	Saturday	nearest full	moon
Macheke	Macheke	—	No	fixed dates	
Makwiro	Makwiro	D. M. Syme	20	18	15
Makoni North	Makoni	J. G. Monckton	28	26	30
Makoni	Rusape	R. C. Maclagan	14	12	9
Marandellas, Northern	Marandellas Farmers' Hall	A. Nicholson	7	5	2
Marandellas, Southern	Inoro	J. Gibberd	4	2	6
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	4	2	6
Mashonaland, Northern Section	Various	T. H. Newmarch	No	fixed dates	
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed dates	
Matopo Branch, R.L. and F.A.	Sibali	—	..	9	..
Mazoe	Glendale Siding	A. G. McCall	11	9	13
Melsetter (North)	Various farms	N. N. Rutherfurd	..		..
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	13	11	8
Northern Umtali	Farm Summerfield	R. O. H. Blurton	7	..	..
Norton and District	Norton Store	W. Wrench	7	5	2
Que Que	Que Que	E. J. Ross	21	19	16
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	27	25	29
Selous	Makwiro	A. L. Douglas	21	19	16
Selukwe	Selukwe	F. S. Clark	No	fixed dates	
Shamva	Shamva	R. C. Frith	..	16	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	12	..
Umvukwe	Various ranches	M. Mitton	14	12	16
Umtali	Christmas Pass Hotel	J. S. Holland	7	5	2
Victoria	Victoria	—	6	4	1
Victoria Midlands	—	G. F. Robertson	..	..	..
Yungu	Yungu	J. H. F[illegible]			

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

The Dairy Industry

The services of a dairy expert, Mr. J. B. Fisher, N.D.D., are now available to the public for consultation, advice and instruction. Enquiries should be addressed to him direct at the Department of Agriculture, Salisbury. Addresses and demonstrations may be arranged, and as a guide to farmers' associations or other bodies desiring lectures, the following subjects are mentioned as being suitable for this purpose, although any cognate subject specially desired can be dealt with:—

1. The care of milk from the cow to the dairy.
2. Cream separators and their use.
3. Butter-making on the farm.
4. Milk and cream testing.
5. Hard cheese-making: cheddar, etc.
6. Sweet milk cheese-making: Gouda, etc.
7. Soft cheese-making: cream, cottage, Gervais, etc.
8. Preparation of cream for sale to butter factories.
9. Curing of bacon and ham on the farm.
10. The milk record of a herd.

The Poultry Industry

A poultry instructor, Mr. A. Little, having now been added to the staff of the Department of Agriculture, farmers' associations, individual

farmers and poultry keepers are invited to communicate with him direct on all matters relating to the subject. Personal visits where desired will be arranged, and lectures can be delivered on various aspects of the subject. For the guidance of those interested, the following subjects are indicated as suitable, but other matters can, if desired, also be dealt with:—

1. Selection of stock.
2. Housing and runs.
3. Incubation: natural and artificial.
4. Brooder management and care of hen and chicks.
5. Growing stock.
6. Rearing on a large scale; systems.
7. Killing and marketing.
8. Production of eggs, testing, preserving, marketing.
9. Farm poultry.
10. Breeds for utility and exhibition.
11. Selection and mating; records.
12. Standards and judging; points.
13. Diseases; treatment and prevention.
14. Internal and external parasites; prevention and extermination.
15. The foods of the country and how to utilise them.
16. *Post-mortem*, with explanations.

Progressive courses of instruction can also be arranged.

The Tobacco Industry

The appointment has recently been made of an officer, Mr. W. H. Taylor, as tobacco and cotton expert.

Advice upon all matters appertaining to culture, curing and marketing of tobacco will be furnished on application to him, and he will be also available to visit farms, attend meetings and deliver addresses on the subject.

The possibilities of cotton growing demand attention, and Mr. Taylor will undertake investigation of this question. All interested in this subject also are invited to communicate with him at the Department of Agriculture, Salisbury.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 61. Requirements in sending Botanical Specimens to the Department for Identification.
No. 62. Services of Agricultural Engineer.
No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt.
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 90. Reports on Experiments—Experimental Station, Salisbury, 1910-1911, by J. H. Hampton.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.
No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultural Engineer.
No. 177. Notes on the Raising of Seedling Trees, by F. B. Willoughby.
No. 189. The Manuring of Maize on the Government Experiment Farm, Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W. M. Watt.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F. B. Willoughby.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.

No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 257. Maize Grading, by J. A. T. Walters, B.A.
No. 259. Statistics of Live Stock and Animal Produce, 1916, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 260. Rhodesian Farm Orchard, by A. G. Turner.
No. 267. Trees for Farm and Ornamental Purposes, by W. E. Dowsett.
No. 268. Manuring Maize, Government Farm, Gwebi, by A. G. Holborow, F.I.C.
No. 269. Farming in Granite Country, by R. C. Simmons.
No. 279. Report on Crop Experiments, Gwebi, 1916-17, by E. A. Nobbs, Ph.D., B.Sc.
No. 281. Statistics of Crops, 1916-17, by F. Eyles, F.L.S.
No. 296. Citrus Nursery Work, by A. G. Turner.
No. 300. The Dangers and Prevention of Soil Erosion, by W. M. Watt.
No. 303. Statistics of Crops, 1917-18, by E. A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 304. Report on Experiments, Gwebi, 1917-18, by E. A. Nobbs, Ph.D., B.Sc.
No. 305. Manure Supplies, by E. V. Flack.
No. 315. Descriptive List of Trees and Shrubs at Forest Nursery.
No. 320. Maize Grading, by C. Mainwaring.
Tree Culture in Southern Rhodesia, by P. B. S. Wrey, A.M.I.C.E.

CROPS.

No. 88. Chicory Growing, by H. Godfrey Mundy, F.L.S.
No. 132. Sumatra Tobacco, Hints to Rhodesian Growers, by C. J. Sketchley.
No. 134. Plans and Specifications for Flue Curing Tobacco Barns.
No. 144. Rhodesian Tobacco—Prospects of an Australian Market, by Eric A. Nobbs, Ph.D., B.Sc.
No. 168. Report on the Methods of Growing, Curing and Selling Bright Tobacco in Virginia, U.S.A., by H. Kay Scorror.
No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch-Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.

No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 293. Some Useful Crops for Granite Veld Farms, by R. C. Simmons.
No. 306. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 309. Maize Grading, by E. A. Nobbs, Ph.D., B.Sc.
No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 75. Fumigation of Fruit Trees with Hydrocyanic Acid Gas, by R. W. Jack, F.E.S.
No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 140. Insect Pests of Tobacco in Southern Rhodesia, by R. W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack, F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S.
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R. W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.
No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.
No. 291. Cutworms, by Rupert W. Jack, F.E.S.
No. 295. Tsetse Fly in Southern Rhodesia, 1918, by Rupert W. Jack, F.E.S.
No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.

No. 65. Common Ailments of the Horse, by D. R. Chatterley, M.R.C.V.S.

No. 95. Oestrus-ovis in Sheep, by Alec King.

No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington, M.R.C.V.S., D.V.H.

No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.

No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams, M.R.C.V.S.

No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.

No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.

No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.

No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.

No. 312. Anthrax, by C. R. Edmonds, M.R.C.V.S.

No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.

No. 316. Inoculation of Cattle against Redwater and Gall-sickness, by Ll. E. W. Bevan, M.R.C.V.S.

LIVE STOCK.

No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.

No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.

No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.

No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.

No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.

No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.

No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R. C. Simmons.

No. 227. An Experiment in Beef Production, by R. C. Simmons.

No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.

No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.

No. 243. Shedding for Milch Cows, by R. C. Simmons.

No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.

No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.

No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.

No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.

No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.

No. 282. Management of Dipping Tanks, by J. M. Sinclair, M.R.C.V.S.

No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.

——— Arsenite Cattle Dip—How to Mix.

No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.

No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.

No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 314. Tampan or Poultry Tick, by A. Little.
No. 319. The Turkey, by Arthur Little.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H. Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 205. Home Butter Making, by R. C. Simmons.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 226. Classification of Clouds.
No. 237. The Analysis of Agricultural Products, Soils, Water, etc.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.

Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.

Game Law: Summary of.

Terms for Analysis by the Department of Agriculture, of Produce, Soils, Water, etc

Directory of Rhodesian Farmers and Ranchers.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

A. B. H.—As farm manager or similar opening. Experience of farming in Union and Rhodesia. Excellent references.

T. F. A.—Two lads, ages 15 and 14, as farming pupils, apprenticed.

N. C. C.—As farm manager. Considerable experience in general farming, stock and agriculture as manager. Age 28 years; steady: good references.

A. M.—On farm or ranch to gain experience. Small salary in addition to board and lodging; 19 months' experience in Rhodesia, 6 months in Bechuanaland; excellent references.

V. P. L.—Desires opening on farm for purpose of training in agriculture. Quarters and board for self and wife in return for services.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 124 of 1919.] [28th March, 1919.

"WATER ORDINANCE, 1913."

IT is hereby notified that His Honour the Administrator has been pleased to make the following grant under the "Water Ordinance, 1913" :—

To *Walter James Woods*, in respect of the land known as Colne Valley Farm, in the district of Salisbury, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use from the Umwindsi River such quantity of storm and public water as can be beneficially and economically used for the irrigation of fifteen acres of land riparian to the said river, on the said farm, by means of a storage dam on the said farm, erected at a point approximately 1,500 yards from its eastern boundary, on the following conditions :—

(1) That in this grant the aforesaid apportionment of public water shall mean the whole or any portion of such public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Colne Valley, in extent approximately 2,600 acres. On any sub-division of the farm, this grant is subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the eighth day of March, one thousand nine hundred and nineteen.

No. 191 of 1919.] [16th May, 1919.

"WATER ORDINANCE, 1913."

IT is hereby notified that His Honour the Administrator has been pleased to make the following grants under the "Water Ordinance, 1913" :—

1. To *Ellen Constance Steedman*, in respect of the land known as Gando Farm, in the district of Gwelo, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use three-fourths of the public water in the Kwe Kwe River, measured at the upper or south-eastern boundary of the said farm, for the irrigation of land riparian to the said river on the said farm, subject to the following conditions :—

(1) That in this grant three-fourths of the public water shall mean three-fourths of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Gando, in extent approximately 2,200 morgen. On any sub-division of the farm, this

grant shall be subject to revision in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the fifteenth day of March, one thousand nine hundred and nineteen.

2. To *William Adam Beattie*, in respect of the land known as Wylde Grove Farm, in the district of Chilimanzi, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-third of the public water in the Zidza River, as measured near the upper boundary of the said farm and irrespective of any grant of diversion at this point to the farm Lovedale, for the irrigation of land riparian to the said river on the said farm, subject to the following conditions :—

(1) That in this grant one-third of the public water shall mean one-third of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Wylde Grove, in extent approximately 3,000 morgen. On any sub-division of the farm, this grant shall be subject to revision in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the twenty-fourth day of March, one thousand nine hundred and nineteen.

3. To *William Adam Beattie*, in respect of the land known as Wylde Grove Farm, in the district of Chilimanzi, under the powers conferred by the "Water Ordinance, 1913," the right to impound, store and use storm water for irrigation purposes on the said farm, by means of a reservoir constructed in the bed of the Zidza River between the farms Wylde Grove and Lovedale, near the southern boundaries of the said farms, the quantity of storm water hereby authorised being so much as can be beneficially and economically used for the irrigation of fifty acres of land on the farm Wylde Grove, but not to exceed two and one-half acre feet of water for every acre irrigated, subject to the following conditions :—

(1) That the normal flow of the Zidza River, except such portion thereof as may be granted for use on the said farm, shall not be impeded by the said impounding and storage.

(2) That the first storm water or freshet of any season shall be allowed to pass down the river.

Dated the twenty-fourth day of March, one thousand nine hundred and nineteen.

4. To *Henry Hallam*, in respect of the land known as Lovedale Farm, in the district of Chilimanzi, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use one-third of the public water in the Zidza River, as measured near the upper boundary of the said farm and irrespective of any grant of diversion at this point to the farm Wylde Grove, for the irrigation of land riparian to the said river on the said farm, subject to the following conditions :—

(1) That in this grant one-third of the public water shall mean one-third of the public water remaining after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Lovedale, in extent approximately 3,000 morgen. On any sub-division of the farm, this grant shall be subject to revision in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom

the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

Dated the twenty-fourth day of March, one thousand nine hundred and nineteen.

5. To *Henry Hallam*, in respect of the land known as Lovedale Farm, in the district of Chilimanzi, under the powers conferred by the "Water Ordinance, 1913," the right to impound, store and use storm water for irrigation purposes on the said farm, by means of a reservoir constructed in the bed of the Zidza River between the farms Wylde Grove and Lovedale, near the southern boundaries of the said farms, the quantity of storm water hereby authorised being so much as can be beneficially and economically used for the irrigation of fifty acres of land on the farm Lovedale, but not to exceed two and one-half acre feet of water for every acre irrigated, subject to the following conditions:—

(1) That the normal flow of the Zidza River, except such portion thereof as may be granted for use on the said farm, shall not be impeded by the said impounding and storage.

(2) That the first storm water or freshet of any season shall be allowed to pass down the river.

Dated the twenty-fourth day of March, one thousand nine hundred and nineteen.

No. 137 of 1919.] [4th April, 1919.

APPLICATION FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water:—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
E. H. Rivers	Odzani	Umtali	Farm Odzi Junction

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 162 of 1919.] [18th April, 1919.

APPLICATION FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water:—

Name of applicant.	From what river.	Native district.	For the purpose of irrigating a certain portion or portions of the
R. Harvey	Umtali	Umtali	Farm Argyll

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 183 of 1919.] [9th May, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to repeal so much of Government Notice No. 61 of 1919 as constitutes a guard area around the area of infection composed of the farms Burnleigh and Bamboo Creek, in the Mazoe native district.

No. 200 of 1919.] [23rd May, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area :—

GWELO NATIVE DISTRICT.

(a) *Area of Infection.*

An area bounded by a line drawn from the south-western beacon of Adair along the western boundaries of that farm and Barkley and the southern boundary of Boschkloof, and along the western boundary of Long Valley, the western and northern boundaries of Northfield to the Long Valley Spruit, and down that stream to its confluence with the Que Que River; thence up that river to the farm Doon, along the northern and eastern boundaries of that farm and the eastern boundaries of Shawlands, Loads, Sunbury and Garryowen; thence along the northern boundary of Ardpatrick, the southern boundary of Garryowen, the eastern and southern boundaries of Adair to the point started from.

(b) *Guard Area.*

The Gwelo native district and the farms Elliott, Umtabekwe, Highlands, Safago, Home, Slades, Lancastershire Estate, Wallclose, Beacon Kop and the Engesi Source in the Selukwe native district.

No. 201 of 1919.] [23rd May, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to declare, in terms of section 17 of Government Notice No. 21 of 1917, the following area of infection and guard area :—

MAZOE NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Avonduur, Leopards Vlei, Wolf Hill and Glen Divis.

(b) *Guard Area.*

The farms Erin, Wiseacre, Gosforth, Kasipa, Dalnagreine, Rocky Spruit, Geluk, Simoona Reserve and Pimento Park, but excluding the road through Simoona Reserve and Pimento Park to Simoona Siding.

No. 219 of 1919.] [30th May, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 24 of 1919, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard areas in lieu thereof :—

MELSETTER NATIVE DISTRICT.

(a) *Areas of Infection.*

The farms Grasslands, Sawerombi, Mermaids' Grotto, Nooitgedacht, Morgensen and Rookwood.

(b) *Guard Areas.*

(1) The farms Ruwaka, Bulls' Run, Honeykloof, Greyville, Murari, Limecliffs, The Flats, Freshfields, Pasture, Greystone and the Mutambara Reserve, excluding a strip of four miles along the Odzi River.

(2) An area bounded by and including the farms Weltevreden, Camperdown, Cromer, Nyanydzi, Biriwiri, Admiral, Ashbourne, Brooklyn, Zebra, Brackenbury, Rookwood, Highlands, Waterfall, Vlei Plaats, Groenvlei, Newcastle, Landsdown, Heilrand, Dingly Dell, Woodbine, Ravenswood, Helvetia and the Anglo-Portuguese boundary.

No. 184 of 1919.] [9th May, 1919.

"CATTLE CLEANSING ORDINANCE, 1918."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Cattle Cleansing Ordinance, 1918," to withdraw the exemption contained in Government Notice No. 377 of 1918 in respect of the following area :—

An area within a radius of five miles of the Nyika dipping tank, situated on the native reserve in Bikita sub-district of the native district of Ndanga.

No. 202 of 1919.] [23rd May, 1919.

TSETSE FLY, WANKIE DISTRICT : OPEN SHOOTING AREA.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Game Law Consolidation Ordinance, 1906," to suspend the operations of sections 9, 10 and 12 of the said Ordinance in respect of all game within the following area in the Wankie district from date hereof.

Description of Area.

From the railway bridge across the Gwaai River, thence down that river to its junction with the Inyantue River, thence up the latter river to the railway line and along the railway line to the first-named point.

No. 157 of 1919.] [18th April, 1919.

ESTABLISHMENT OF A POUND ON FARM SERUI SOURCE. HARTLEY DISTRICT.

HIS Honour the Administrator has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Hartley, to declare and make known that a pound has been established on farm Serui Source, in the magisterial district of Hartley, and that the said pound shall be available for the public from the date hereof.

No. 179 of 1919.] [2nd May, 1919.

POUND AT NENGWA, HARTLEY DISTRICT.

HIS Honour the Administrator in Council has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Hartley, to abolish, as from 2nd May, the pound on the farm Nengwa, established by Government Notice No. 23 of 1913, and to establish a pound on the farm Glorvina, in the magisterial district of Hartley. The said pound shall be available for public use as from 2nd May, 1919.

No. 208 of 1919.] [30th May, 1919.

ODZI POUND.

IT is hereby notified that His Honour the Administrator has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," to declare and make known that a pound has been established at Odzi, in the magisterial district of Umtali, and that the said pound shall be available for public use from 1st June, 1919.

POUND SALES—CHARTER DISTRICT.

IT is hereby notified that pound sales will be held as under for the half-year ending 30th June, 1919, and that Carl Friedrich Wilhelm Nauhaus has been appointed poundmaster.

Grasslands Farm—10 a.m., first Monday in each month.

THE RHODESIA
Agricultural Journal.

Edited by the Director of Agriculture,
assisted by the Staff of the Agricultural Department.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

MAIZE ELEVATORS.—The public has already been informed of the fact that an expert in matters relating to the storage and transport of maize is at present studying conditions in South Africa with a view to the introduction of a general system of bulk handling to replace the present primitive and uneconomical process of bagging. Mr. Littlejohn Phillips has been invited, on the completion of his tour of the Union, to come to Rhodesia for a similar purpose.

Every country has its own peculiar conditions affecting a problem such as this. In our case the obvious difficulties requiring solution

commence with the fact that, even in the heart of our maize belt, production is diffuse rather than concentrated, distances are considerable, and only rarely are large quantities of maize brought to one point for loading on to rails. Silos for storing in bulk can hardly be provided immediately at every station and siding, hence to some extent the existing system must continue side by side with improved methods. Transport from the farm to the railway may, on account of the state of the roads and the type of wagon suited to the country, have to continue as at present, whilst railage in bulk must wait until special trucks can be supplied. Whatever doubts may exist on these points, there can, however, be no question that storage in bulk at the port would effect a very material saving, which should be to the ultimate benefit of the producer in the one case and the consumer in the other. Another point for the expert to determine is whether the expense involved in introducing modern methods is warranted by the quantity of traffic offering, which so far has never quite reached 500,000 bags, say 50,000 tons.

The system involved, whether at the station or the port, may be briefly described. The grain is brought either in bags or in bulk by wagon or by railway truck to the elevator. Here it is delivered downwards, thus saving labour, into a hopper, from which it is mechanically elevated—whence the name elevator—and conveyed by belts to bins or silos where the grain is stored in bulk. If necessary, the maize, before it falls into the silo, can be rough screened, weighed or diverted to a dryer or winnower, where, by processes of heating, cooling and fanning, all excess moisture is removed, weevils are killed and all dust and dirt removed. To remove grain from such stores, it is tapped from below, like a liquid, again elevated and weighed and delivered in bulk or bagged as may be desired.

The processes of killing weevils and drying the maize would in practice only be necessary at the coast, where also arrangements could be made for the mechanical loading of vessels. By these means economy both in labour and in grain is effected, for all manual labour is obviated, as is also loss through torn bags, slings, leakage in dumps, and on wharves and lighters. Damage from exposure is prevented, as well as from wet, weevil, moth or rats. Further benefits consist in the rapidity with which trucks can be unloaded and released and ships loaded, whilst ground space is saved and the cost of warehouses reduced. There is thus a great saving in handling and storing, both directly and indirectly, with a corresponding benefit to all parties.

The adoption of this system involves, of course, a serious change which must be realised. For instance, all maize of the same grade is unavoidably mixed together in the same chamber. The owner, be he farmer, speculator or dealer, who delivers a certain number of bags of grain of a given grade to an elevator receives back or sells in due course a corresponding quantity, but not the self-same grain. In practice and in the trade, however, this fact is recognised, and has occasioned no difficulty whatever.

The report of the expert on these matters will be eagerly awaited, and it is earnestly to be hoped that his recommendations may lead to improvements in our present crude and uneconomical system.

AFRICAN COAST FEVER.—The position at the infected farms Clearwater and Northfield, Hunter's Road, Gwelo district, is still serious, and notwithstanding three-day dipping, cases are still occurring. As yet there has been no manifestation of infection elsewhere in the district, but previous experience shews that where infection is intense and has existed for a considerable period prior to its discovery further outbreaks are to be expected up to 12 months from the date on which cattle movements were suspended.

At the farms Avonduur and Leopards' Vlei, in the Mazoe district, where infected cattle from Hunter's Road were destroyed on 16th May last, the disease appeared amongst the farm cattle on 6th July, and within 14 days 60 head died or were destroyed as diseased. These cases are of course due to infected ticks dropped by the Hunter's Road cattle.

In the Victoria district the position is most satisfactory. The eastern section has just been released from quarantine, and at the Zimbabwe section it is now five months since the last case of disease occurred.

In the Melsetter district the position is favourable; although five fresh outbreaks have been recorded this year, the mortality in each case has so far been restricted to one beast.

THE SALISBURY SHOW.—The Rhodesian Agricultural and Horticultural Society's show, to be held at Salisbury on the 20th, 21st and 22nd August, promises to eclipse all previous shows held by the Society, both as regards entries and the quality of the exhibits. The cattle section will be exceptionally strong, and competition in the various classes will undoubtedly be keen, especially so as Matabeleland breeders are expected to be well represented. Chief interest this year will be centred in the competition for the "Milne" trophy, which is to be awarded to the champion bull in the show yard. The trophy, which is a floating one, is valued at £500, and accompanying it are a replica and cash prizes amounting to £175. The public spirit which prompted this generous gift is highly commendable, and its bestowal will, we are sure, do much to help forward the great work of improving the quality of cattle in this country.

The maize section is expected to constitute a record for Rhodesia in point of entries, and these are representative of all the maize growing areas of the Territory, while exhibits are also being sent up from the Union. We have seen some splendid samples of last season's maize, and the standard of quality at the forthcoming show will undoubtedly be a high one.

The Salisbury and District Poultry Club have arranged a comprehensive prize list, and keen competition is expected in the various classes. Two items not included in the schedule are (1) best hatch of chicks from a Tamlin incubator, and (2) 30 dozen fresh eggs, Rhodesian produce, packed for commercial purposes. The prize for the former is a Wilson mill and for the latter £10 cash.

A novel and interesting feature of the exhibit of the Department of Agriculture will be a small ginning plant, which will treat samples of cotton grown in the Territory.

Attention is also drawn to the programme of instruction in agricultural matters arranged by the Department for the third day of the show. In order that the scope of the subjects to be dealt with may be widely known, we reproduce below *in extenso* the programme and time table drawn up:—

9 a.m.—Tour of the cattle section, conducted by Dr. Nobbs, for scholars. Tour of the produce section, conducted by Mr. Mainwaring, Assistant Agriculturist.

10 a.m.—Address on seed maize, by Mr. S. Mottram, of Potchefstroom, President of the Maize Growers and Breeders' Association of the Union of South Africa, at the Grand Stand. Tour of the poultry section, conducted by Mr. Little, Poultry Expert, for scholars. Tour of tobacco section, conducted by Mr. Taylor, Tobacco Expert.

11 a.m.—Demonstration of points of cattle in the ring, by Messrs. Drysdale & Barnet, Cattle Judges. Demonstration of selection of maize for seed, by Mr. Mainwaring, at the exhibit of the Department of Agriculture. Tour of the dairy produce section, conducted by Mr. Fisher, Dairy Expert.

11.30 a.m.—Demonstration of cotton ginning and tobacco seed sorting, by Mr. Taylor, at the exhibit of the Department of Agriculture.

12 noon.—Demonstration of home cheese making, by Mr. Fisher, Dairy Expert, for public and scholars. Demonstration of block test. Tour of the fruit section, conducted by Mr. Turner, Citrus Adviser.

2 p.m.—Address on egg production, by Mr. Little, Poultry Expert.

2.30 p.m.—Demonstration of selection of maize for seed, by Mr. Mainwaring. Demonstration of cotton ginning and tobacco seed sorting, by Mr. Taylor. All at the exhibit of the Department of Agriculture.

3 p.m.—Address on "Beauty on Veld and Farm," by Mr. George Duthie.

4 p.m.—Tour of poultry section, conducted by Mr. Little. Tour of produce section, conducted by Mr. Mainwaring. Tour of tobacco section, conducted by Mr. Taylor. Tour of pig section, conducted by Mr. Fisher. Tour of fruit section, conducted by Mr. Turner.

The technical officers of the Department of Agriculture may be consulted during the course of the day at the departmental exhibit at fixed hours, which may be ascertained on application there. The personally conducted tours will take place at the pens or stands of each section.

Various improvements have been carried out at the show ground—all entailing expenditure—and it is to be hoped that the public will give the show their hearty support, for it is an event in which all classes of the community are more or less concerned.

Tobacco.—We would draw attention to the article appearing in this issue dealing with tobacco seed beds. This is the first of a series of articles which Mr. Taylor hopes to contribute on the subject of tobacco culture in general, and we would advise prospective growers to preserve for reference the *Journals* in which these articles appear.

It is also hoped in the October number of the *Journal* to publish revised plans of tobacco barns specially adapted to present local conditions, and these we commend to the notice of all concerned.

Indications point to a considerable revival of the tobacco growing industry in this Territory, attributable, of course, to the preferential tariff given by the Imperial Government for colonial grown leaf, and it is possible that we shall see a record acreage placed under this crop next season. We would here utter a word of warning to prospective growers of tobacco, and especially to those who have no previous experience of the crop, to plant only such areas as can be efficiently coped with. Conditions on the English market, as well as in South Africa, are rapidly becoming normal, and it will be useless attempting to dispose of tobacco of inferior quality.

It is general knowledge that certain growers in this country have been successful in curing good quality tobacco at their first attempt, but have failed to do so subsequently. Tobacco can only be successfully grown by careful and systematic attention to the various cultural operations, while knowledge as to the particular treatment required in the curing process can only be acquired in the hard school of experience. In the tobacco industry perhaps more than in any other is personal supervision necessary, and we cannot emphasise too strongly the necessity for a modest beginning. However, there is now a splendid opportunity for establishing our tobacco industry on a sound basis, and we welcome the signs that the farmers of this Territory intend to avail themselves of the generous conditions presented by the Imperial Government.

We would take this opportunity of mentioning that a handbook dealing with all the various operations of tobacco culture can be procured from the Department of Agriculture for the sum of 2s. 6d.

Quarter-evil.—Quarter-evil is still spreading in the form of a mild epizootic, and a number of herds in the Charter, Chibi, Chilimanzi, Salisbury and Mazoe districts have become infected during the last few weeks. Supplies of vaccine are coming forward steadily, and it is hoped that from now on there will be sufficient to meet all requirements. In addition to supplies already ordered, arrangements have been made for 5,000 doses weekly from the Veterinary Research Station, Onderstepoort, Pretoria. The first consignment of "filtrate" vaccine from New York has left Capetown, and should arrive here by the time this *Journal* appears. It has been suggested that the efficacy of this material may be affected by heat in passing through the tropics, and a field experimental test is now progressing.

TSETSE FLY.—In this issue will be found a paper by Mr. R. W. Jack, Agricultural Entomologist, dealing with the steps now being taken to test the efficiency of certain measures as a means of fighting the tsetse fly menace.

Investigations by scientists in many different parts of Africa associate the common tsetse fly of this Territory, namely *Glossina morsitans*, with "big game." The Royal Commission on Sleeping Sickness in Nyasaland published the following conclusions in 1915:—

(1) "When the country becomes opened up, cleared and settled, the big game will disappear and the tsetse with them. Until then it would appear to be the best policy to keep down the number of wild game in fly areas as much as possible," etc.

(2) "From this"—namely, the fact of game harbouring the infection of fly-borne disease—"it would seem to be self-evident that these wild animals should not be allowed to live in fly country, where they constitute a standing danger to the native inhabitants and domestic animals. It would be as reasonable to allow mad dogs to live and be protected by law in our English towns and villages. Not only should all game laws restricting their destruction in fly country be removed, but active measures should, if feasible, be taken for their early and complete blotting out," etc.

The practical impossibility of stamping out all warm-blooded animals from any large area has been urged as a reason for not clearing out the larger mammals alone, small mammals and birds being left undisturbed. Nevertheless this procedure seems warranted on an experimental scale by the available evidence, anything in the nature of a general holocaust being, however, judged both unwarranted and inadvisable until the results of the local undertaking are apparent.

In this connection attention may be drawn to the creation of a free shooting area between the railway line and the Gwaai River, the area being bounded by the railway line, the Gwaai and the Inyantue Rivers. In this large tract all wild animals may be shot without permit and without regard to season, thus creating a buffer area between fly-free country and the region in which the carefully controlled experiment is being conducted, and in which observations are being made as to the effect of clearing out game, carnivora, baboons and other animals from a defined area and keeping it clear for a prolonged period. Incidentally the concentration of sportsmen and hunters in the free shooting area will be serving a useful public purpose and assisting the experiment.

STORKS.—It is interesting to get further evidence that the common white storks, or large locust birds (*Ciconia alba*), so plentiful at times in Rhodesia, are the identical birds, the very same individuals, which nest on the house-tops and are universally protected and cherished in Europe. Here also they are valued and preserved by law on account of the services they render in devouring not only locusts but also ticks, caterpillars and grasshoppers, and, it is believed, harmful beetles and grubs and snakes as well.

We have recently received from the Rev. Father Benno, of Monte Cassino, Macheke, an identification ring taken from a dead stork found there at the end of May. This ring is inscribed with an address indicating that it hails from Viborg in Denmark, and a letter is being sent reporting the occurrence.

In September of last year a ring was found on a crippled stork by Mr. Lamb, of Eskbank farm, near Salisbury, also from Viborg, and enquiries elicited the information that the bird had been so marked as a nestling eighteen months previously. It appears that many migratory birds are so marked in Denmark, Holland and other European countries where they nest. It is the object of the ornithological societies there to accumulate records of this description, and so to form some idea of the nature and extent of the migration of birds. Some years ago a ring found on a stork in Melsetter proved it to have come from Austria, whilst another bird from the same nest was reported from Jerusalem, thus indicating the probable route followed. Only, however, by the collection of numerous data can any authentic ideas be arrived at on this interesting subject. One interesting fact mentioned in correspondence is that in 1917, when the birds were very plentiful here and stayed long with us, they were observed in Denmark to be not half so numerous as usual. The following enquiries are also made, and we would be glad to receive observations on the subject from persons interested, in order that they may be collected and conveyed from many sources to those interested in Europe. The questions asked are:—(1) Do storks ever breed here, and if so, where? (2) What class of veld do they chiefly favour? (3) What food do they eat? (4) Local names. (5) Do they arrive in small or large parties or singly, and from what direction and at what season? (6) Similar facts as to their departure. (7) Does the black stork (*Ciconia nigra*) also occur, and if so, does it accompany the common stork? (8) What other birds are found accompanying the storks?

We would be glad to assist in this matter by hearing from anyone on these points or regarding ringed storks or other birds.

Weather Bureau.—We would draw the attention of farmers and others who have undertaken to supply weather reports to the meteorological office of the Department of Agriculture to the necessity of furnishing the information regularly. Examination of the Weather Bureau figures appearing in this *Journal* will shew numerous instances in which returns have not been sent in, and it is obvious that these discrepancies render all the information given for the remainder of the season of but little value. These discrepancies are particularly noticeable when the dry season sets in, and many recorders are apparently under the impression that when the rainfall is nil it is not necessary to send in a return. This is not the case, and we trust that after this explanation returns will be sent in regularly each month. We might mention that it is hoped at some future date to undertake the work of forecasting weather conditions in this Territory, and it is only with the aid of complete and accurate data extending over a period of years that it will be possible to attempt this important work.

Cattle Poisoning.—The Agricultural Chemist requests that when stomach contents of animals suspected to have died from poisoning are submitted for examination, any portion of the stomach or intestine which shews signs of inflammation or other abnormality shall also be forwarded.

While mentioning the above matter, we take the opportunity of again drawing attention to the fact that samples of dipping fluids are frequently received at the Government Agricultural Laboratory for analysis without any indication being given as to the sender.

For general information it may be stated that no samples will be analysed unless the following particulars are clearly set out on a label securely attached to the bottle:—(1) Name of sender; (2) postal address; (3) brand of dip used; (4) date sample was taken. The label giving the above particulars should preferably be gummed on to the bottle. A covering letter or post card should be sent at the same time as the sample, so that the consignor can be notified should the sample be lost in transit.

Extracts from the Report of the Chief Veterinary Surgeon

FOR THE YEAR 1918.

Presented to the Legislative Council.

African Coast Fever.—The number of fresh outbreaks during the year was 5, with a mortality of 374 head, as compared with 13 and 438 respectively during the previous year. Four of these occurred in Victoria district, and were of course extensions from existing centres of infection; the fifth was in the Shamva section of the Mazoe district, an area not at any time previously infected with Coast Fever. Generally, the position is more favourable than for many years past, and the congregation at Odzi by road and rail of about 12,000 head of cattle purchased by the Imperial Government in all parts of the Territory without a single case of Coast Fever or other infective disease

may, I think, be regarded as evidence of the good health of cattle in general, and also of the efficacy of our quarantine regulations and the control of cattle movements by the permit system.

Salisbury, Mrewa, Umtali, Melsetter and Gwelo Districts.—There were various centres in these districts on which disease had occurred during the previous year; as no fresh cases occurred, all restrictions were removed in the Mrewa and Gwelo districts, and in the others the quarantine areas were reduced considerably in extent.

Victoria District.—In three of the four fresh outbreaks which occurred in this district the degree of infection was very mild, as may be judged from the fact that out of 1,161 head involved the total number of cases of Coast Fever was six; this satisfactory result must be attributed to the early detection of infection and the satisfactory manner in which dipping had previously been carried out. In May a serious outbreak was detected at two native kraals on the Morgenstar Mission farm, and shortly afterwards further centres of infection were discovered on this and the adjoining farm Mzero. There is not the slightest doubt that the disease had existed on these farms for several months, as out of 155 head in the two herds in which it was first detected 104 died or were destroyed before the end of the month; in addition to this, some 38 head could not be accounted for, and it may be assumed that Coast Fever was the cause of their disappearance. In view of the known existence of Coast Fever at no great distance from Morgenstar, it is surprising that the European owners of the farms concerned, and under whose supervision the native cattle were supposed to be dipped, did not take a more intelligent interest in them; such would doubtless have resulted in the earlier detection of the disease, and consequently lessened the danger of its spreading to adjoining herds and also a smaller loss in the herds involved.

At the previously infected centres a heavy loss occurred during January and February, but since April only one case has been recorded.

The work of the officers engaged on this work was severely handicapped during the earlier months of the year by the extraordinarily heavy rains, and it was with the utmost difficulty and personal discomfort that the known infected centres were attended to. They are to be congratulated on the manner in which they carried out their duties, and that no greater spread of infection occurred.

Mazoe District.—In February a number of cattle died on the farm Burnleigh, Shamva section, and after considerable observation the existence of Coast Fever was demonstrated. The farm records shewed a number of deaths since July of the previous year, but these were attributed to the unusually severe winter and subsequently to the constant and exceptionally heavy rains. The total mortality was 8 head out of about 250, shewing that the degree of infection was mild, due probably to the fact that the cattle had been regularly and properly dipped. No cases have occurred since April, and there was no extension of infection, though one doubtful case occurred on the adjoining farm Bamboo Creek.

Cattle Cleansing Ordinance, 1918.—The draft Cattle Cleansing Ordinance, recommended by the Committee of Enquiry on Coast Fever

which sat in 1917, was passed by the Legislative Council with certain amendments suggested by the Agricultural Union. This Ordinance, which repealed the Compulsory Dipping Ordinance, 1914, was promulgated in September, and thereupon became operative in all areas to which the provisions of the latter had been applied. Provision exists for its application to the remaining portions of the Territory, and as circumstances permit it will be applied to these.

During the year the number of dipping tanks was increased by upwards of 265, the total number now being 1,263. Arrangements have been made for the construction of a large number by land-owners on native reserves and unalienated land. Cement, however, is very scarce, and until it is more freely obtainable it will not be possible to insist on reasonable compliance with the Ordinance throughout the areas in which it is now in force, or to extend its provisions to areas at present exempted.

GALL-SICKNESS IN CATTLE.—A considerable mortality, in young stock chiefly, occurred from gall-sickness on farms where dipping has been practised for a number of years, and stock-owners are apprehensive lest this should become a seasonal occurrence if regular and proper dipping is maintained. There is no doubt that dipping prevents the establishing of that degree of immunity against gall-sickness and red-water which is necessary to protect cattle when exposed to free tick infestation, but when stock contract gall-sickness and die on farms where dipping has been regularly carried out for a number of years, the position is admittedly serious, and merits attention with the object of providing a remedy. The form of gall-sickness referred to is technically termed "anaplasmosis," and is transmitted by ticks, and as there is no suggestion or evidence of any other vector, one is naturally led to enquire as to the effectiveness of dipping on the farms where this mortality occurred. The best test of the effectiveness of dipping is the presence or absence of ticks. It is beyond dispute that regular and proper dipping results in the reduction of tick life to a minimum, and that immunity to gall-sickness is correspondingly reduced has been amply demonstrated by the heavy mortality which occurred in several instances where cattle which had been regularly dipped were removed to veld where dipping facilities did not exist. On several of the farms on which the mortality referred to occurred, it is admitted that ticks had increased enormously during the latter part of the year; indeed, in one case the owner states that, excluding the blue variety, there were more ticks on his cattle than when he started dipping some seven or eight years previously. With these admitted facts before us, it is reasonable to assign the mortality from gall-sickness on farms where dipping is carried out to the increase in tick life, as the result of dipping in solutions of ineffective strength.

There are other factors which may have contributed to the increased number of cases and heavy mortality, viz., (1) the greater susceptibility of pure-bred and highly-graded cattle; (2) an exaltation of the virulence of the disease. The virulence of gall-sickness undoubtedly decreases as ticks are dipped out, but there is no doubt that what may be termed the normal type increases in virulence by passage through well-bred

cattle. The prime cause, however, is tick life. Ticks cannot be entirely eradicated in this country, but they can be reduced to a minimum and kept there by effective dipping; any increase in their numbers will assuredly be followed by an increase in the incidence of gall-sickness.

QUARTER-EVIL.—The Assistant Chief Veterinary Surgeon states that this disease appears to have assumed the character of an endemic or annual occurrence in Bulawayo and adjoining districts, and thinks that its incidence will assume the same character as in other countries in which it exists. He further notes that it is rare for any but young animals to contract the disease in herds which were infected the previous year, and that in newly infected herds a small percentage of mature animals contract the disease and die. The disease appears to be slowly spreading eastwards, outbreaks having occurred in the Belingwe, Selukwe, Chibi and Gwelo districts, in which the disease had not, as far as is known, existed at any time since the Occupation. The total mortality recorded was 1,104 head, as compared with 1,335 the previous year. Through the generous assistance of the Director of Veterinary Research, Pretoria, over 70,000 doses of vaccine were distributed, and 2,000 doses were obtained from overseas. In April, 1918, Professor Naoshi-Nitta, of the Imperial University, Tokyo, Japan, published an original communication on the result of his work on immunisation against quarter-evil by means of a germ-free filtrate. On receipt of this paper, which the author was good enough to forward, we immediately communicated with him, and asked if he was prepared to supply the filtrate for use in this Territory, but unfortunately he was unable to do so, as all vaccines prepared in the Institute are for home use only. Arrangements were then made for a supply from a reliable Institute in New York, which is expected at an early date. It is claimed for this method of immunising cattle against quarter-evil that (1) it confers an active immunity, (2) that it cannot produce the disease; and (3) that it can be prepared in a concentrated form and will retain its potency for an almost indefinite period. Should it prove effective against the Rhodesian type of quarter-evil, arrangements will be made for a regular supply according to requirements; indeed, the question of its preparation locally would be well worthy of consideration.

ANTHRAX.—Four outbreaks in cattle were dealt with, viz., one in the Mtoko district, two in the Makoni district and one in the Hartley district.

TUBERCULOSIS.—One case of bovine tuberculosis was detected at the Bulawayo abattoirs, and one was reported from the Gwanda district. At the Johannesburg abattoirs 14 cases were found on *post-mortem* inspection of 12,132 head of slaughter stock exported from this Territory. One case in a goat was detected at the Bulawayo abattoirs.

CONTAGIOUS ABORTION OF CATTLE.—A number of fresh centres of infection were discovered. There is no doubt that the disease exists to a much greater extent throughout the Territory than we are aware of.

HORSE-SICKNESS.—The total mortality reported was 161 horses and mules, mostly horses. No statistics are available in several districts, simply a general statement that a heavy mortality occurred; the degree of infection during the season must therefore be regarded as heavy.

TRYPANOSOMIASIS.—Owing to the extension of the tsetse fly belt towards Malindi in the Wankie district, a number of fatal cases of trypanosomiasis in cattle occurred. A slight mortality in cattle occurred in the Hartley and Melsetter districts. In the latter case the tsetse has not been found in the district, but is known to exist in Portuguese territory, close to the boundary.

EPHEMERAL FEVER (THREE-DAY SICKNESS OF CATTLE).—This malady was prevalent during the months of March and April, but the mortality was infinitesimal.

GLANDERS.—No case of glanders occurred, and no re-actions to the mallein test which was applied to all imported solipeds.

RINDERPEST.—It is unnecessary in this connection to refer to the rinderpest position in Central Africa, except to say that, through the efforts of the Veterinary Commission, the southward extension of the disease appears to have been stayed.

STAFF.—It is with the greatest regret that I have to record the death of Mr. Rowland Williams, District Veterinary Surgeon, Salisbury, from pneumonia following influenza. He was an energetic, capable and efficient officer, and his early demise is a great loss to the Department.

IMPORTATIONS.—From the United Kingdom:—Bulls, 64; heifers, 91. From Union of South Africa:—Bulls, 311; heifers, 552; horses, 655; mules, 199; donkeys, 504; pigs, 10; sheep and goats, 22,040.

EXPORTATIONS.—Horses, 45; mules, 84; donkeys, 173; pigs, 593; sheep and goats, 7,337; slaughter cattle to Union of South Africa, 12,132; slaughter cattle to East Africa *via* Beira, 9,976; slaughter cattle to Portuguese East Africa, 453; breeding cattle to Congo, 42; breeding cattle to Portuguese East Africa, 448; breeding cattle to Union of South Africa, 11; farm oxen to Portuguese East Africa, 605.

AFRICAN COAST FEVER.—Infected Centres and Mortality, 1918.

District.	Farm.	Original No. of Cattle.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Melsetter ...	*Existing Outbreak—*														
	Rookwood ...	91	...	...	1	...	...	...	...	...	...	...	...	...	1
Victoria ...	*Existing Outbreaks—*														
	Glenlivet ...	222	55	6	5	1	...	...	...	...	...	...	...	...	67
	Erichsthal ...	1,189	8	5	3	1	...	...	...	...	...	...	...	...	17
	Commonage ...	924	20	8	1	1	...	...	...	...	...	...	...	...	30
	Msari Reserve ...	147	37	10	2	...	...	...	...	...	...	...	...	...	49
	Arowe ...	812	3	1	...	1	...	...	...	...	...	...	...	...	5
	Beza	194	26	15	7	1	...	1	...	...	...	...	...	...	50
	Fresh Outbreaks—														
	Riverside ...	49	...	1	...	...	...	...	...	...	...	...	...	...	1
	Brooklands ...	608	...	1	...	...	...	...	...	...	...	...	...	...	1
	Marowa ...	504	...	...	...	3	1	...	...	...	...	...	...	...	4
	Morgenstar & Mzero	1,975	...	...	...	...	113	5	1	14	3	4	...	...	140
Mazoe ...	*Fresh Outbreak—*														
	Burnleigh ...	250	5	3	1	...	...	...	...	...	...	...	...	...	9
	Monthly Totals ...	...	154	50	20	8	114	6	1	14	3	4	...	...	374

Operations against Tsetse Fly in Southern Rhodesia.

By Rupert W. Jack, F.E.S., Agricultural Entomologist.

The fact that certain operations are being carried out during the present year with a view to ascertaining the possibility of checking the advance of tsetse fly in this Territory is general knowledge. The subject of tsetse fly is, however, one concerning which many individuals hold very strong theories and opinions, and there is a possibility of misconception concerning the scope and nature of the undertaking in hand, and of the reasons which have induced the authorities to adopt one line of experiment to the exclusion of another. The present article aims at placing in the hands of those interested in the matter a reasoned statement of the facts which may help to forestall or answer uninformed criticism, due to incomplete knowledge of the factors governing the situation.

The enormous contraction of the fly-infested areas at the time of the rinderpest in 1896-7 and their subsequent extension are circumstances well known to all interested in the subject. During the period of recess certain areas in the Territory, formerly infested with tsetse, have become occupied to a greater or lesser extent for the purposes of agriculture, ranching, mining, etc. Where settlement has been on a considerable scale, as in parts of the Hartley and Lomagundi districts, civilisation has apparently held its own and kept or driven back the fly. Where only isolated farms or mining properties have been taken up, the fly has, however, in some parts regained its former territory. A notable instance of this nature has occurred during the past two years in the neighbourhood of the Gwaai and Shangani Rivers, not far from their confluence. The spread of the fly in this direction from the north-east has been more rapid and persistent than in any other part of the Territory. Fly was present on the Mzola River (see map) in 1913, by 1916 it was on the Shangani and the Kana, and by 1918 involved a stretch of the Shangani some eighteen miles in length, and was established on the tributaries draining the Gwaai-Shangani watershed into the latter river. During the early part of 1918 an outbreak of trypanosomiasis (fly disease) occurred on one of the two occupied farms on the Gwaai River in this region; and this was followed in February of the present year by a wholesale outbreak amongst native cattle, and on the farm already mentioned, for a distance of 12 miles along the river. Notwithstanding these outbreaks, which have already accounted for some 120 head of cattle, it has not been possible to prove

the presence of tsetse on the Gwaai River itself, and the exact explanation of the numerous cases is still undetermined. It is, however, quite certain that the fly has now reached a point where its presence is more than a menace to cattle on a certain section of the Gwaai River, and every indication points to further advance in the near future. The direction which this movement is likely to take is a matter for speculation, but the greater part of the Shangani River and a large portion of the Gwaai, from its junction with the Gwampa to the Zambesi, are reported to have been infested in pre-rinderpest days, and also a considerable amount of country to the west. A somewhat wide area, including the Shangani Reserve and some of the country lying between the Gwaai River and the western border, must therefore be considered as in possible danger in the course of time.

In certain other parts of the Territory, remote at present from European settlement, the fly has also advanced of recent years, but the problem is nowhere so pressing as in the area indicated.

The Administration, whilst thoroughly alive to the exigencies of the situation, has found itself confronted with the fact that no practicable means of checking the advance of tsetse fly is known, and that experiments to be carried out with this object in view usually entail the expenditure of a large amount of money.

The most obvious method of fighting any pest lies in direct attack on the insect or animal itself, but the extent of country involved altogether precludes a campaign of this nature in the present instance. The possible lines of action appear, therefore, to fall under three headings:—(1) the interposition of a barrier to the fly's advance; (2) the modification of conditions in the threatened area to render it unsuited to the fly; and (3) the modification of conditions in localities already infested on the edge of the fly belt with a view to driving back the pest.

It is obvious at a glance that, granting for the moment the practicability of all three, (1) and (2) could do no more than protect country not yet invaded, whilst (3) affords hope of reclaiming occupied territory, and is therefore, other things being equal, to be preferred.

The next step lies in considerations of a purely entomological nature, namely:—(a) what is likely to constitute an effective barrier to the fly's advance; and (b) what modifications of existing conditions are likely to prove inimical to the fly. The continued existence of tsetse fly, in common with other living creatures, is dependent upon two fundamental necessities, namely, a suitable habitat and an adequate food supply, and it is in the modification of conditions in respect to one or other or both of these requirements that any hope of success lies.

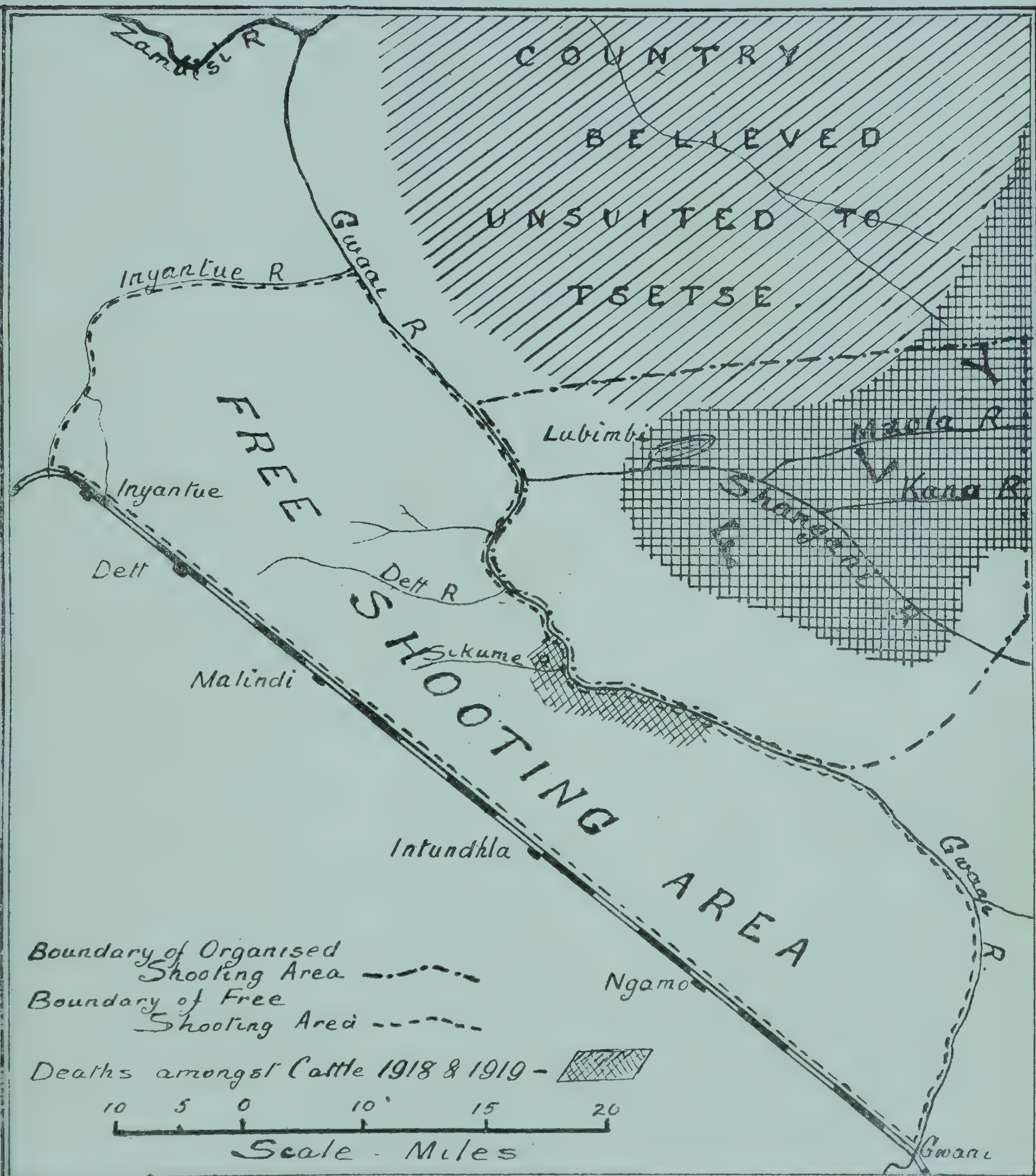
With regard to habitat, the tsetse is known to be dependent upon forest conditions, and little doubt exists that the removal of the forest throughout the infested areas would result in the removal of the fly. It is, however, obvious that the levelling of the forest over the vast areas involved is an absolutely impracticable undertaking in the present

stage of development of the Territory, and we are led, therefore, to consider whether any benefit is likely to result from such limited clearing as appears to lie within the bounds of practicability. In this respect it is important to bear in mind that the problem before the Administration is the stemming of the general advance of the fly, and not merely the protection of isolated properties. Benefit is stated to have resulted in Central Africa from the clearing back of the forest from certain townships, and other centres where the protection of a considerable community and their domestic animals has been the object in view. Clearings of some magnitude are possible under such conditions, particularly as the timber has considerable value for fuel and building purposes. Similar benefit has been derived in this Territory, as in the Hartley district, where the timber has been cut down for the mines. Partially informed individuals have, on this account, a tendency to argue that clearing, having been proved of value in certain instances, is therefore the solution of the present problem. This is an unjustified deduction. Where mining development occurs, the population are bound to make the best of local conditions, even if tsetse fly is included, and may feel moderately satisfied if, after clearing back the bush and taking other precautions, they are able to keep domestic animals without overwhelming loss. No farmer or rancher would feel safe if his cattle ran in the midst of even a considerable cleared area, whilst the surrounding forest was infested with tsetse, and in any case it is obvious that local clearings of this character could have no more effect in stemming the general advance of the fly than isolated rocks in preventing the ebb and flow of the sea.

Superficially it appears practicable to clear a strip of country ahead of the advancing fly, and in this way to create and maintain an effective barrier, but there are far more difficulties associated with this suggestion than appear at first glance. In the first place, it is not known what width of cleared country would prove effective in this respect; secondly, the creation and maintenance of clearings through certain types of forest, such as that consisting mainly of Brachystegia, is a far more costly undertaking than many people imagine; and, thirdly, the supporters of this suggestion do not appear to realise that, unless the barrier almost encloses the whole fly area, there is nothing to stop the fly advancing round the ends.

As is well known, an attempt was made last year to clear a strip of forest a mile in width and twenty-five miles in length between the Gwaai and Shangani Rivers, but the undertaking was not carried to a conclusion on account of the influenza epidemic. It is desirable to make it clear that this undertaking was merely of the nature of a temporary expedient, with a view to a momentary checking of the advance of the tsetse to the Gwaai River, the season being too far advanced for other measures of a more hopeful character. It was realised that the establishment of the fly on the Gwaai would increase the difficulties of the situation, and it was judged desirable to attempt to gain a season's delay. The clearing was never regarded as a permanent solution of the problem.

Whether a deforested strip a mile in width would constitute an


Zambesi R
COUNTRY BELIEVED UNSUITED TO TSETSE.
Gwaai R
Inyantue R
FREE SHOOTING AREA
Lubimbi
Mzola R
Kana R
Shangani R
Inyantue
Dett
Dett R
Sikumi R
Malindi
Intundhla
Ngamo
Gwaai R.
Gwaai
Boundary of Organised Shooting Area
Boundary of Free Shooting Area
Deaths amongst Cattle 1918 & 1919 -
10 5 0 10 15 20
Scale - Miles

effective barrier or not is a doubtful point, which only very careful and elaborate experiments could determine. The writer does not deny the possibility of its doing so, but owing to the fact that the advance of the fly is erratic and unreliable, definite conclusions could only be drawn from an experiment of this nature continued over at least several years, if the result proved to be negative, that is to say if the fly crossed the barrier. If it did not, it would be uncertain whether the fly would have crossed that particular piece of country or not, in the absence of the cleared strip. Of course, if the strip was of sufficient length and the fly eventually spread round the ends of it, but not across it, there would be a fairly reliable basis for concluding that the clearing was efficacious. In the meantime, its practical value would be destroyed. The main objection, however, is that the tsetse in the Sebungwe area is spreading in various directions, and any barrier would need to be at least 200 miles in length to protect the country to south-west and south, which is judged to be in particular danger. The writer is certainly not prepared to advise such an undertaking as an experiment, and the prosecution of research to determine the minimum width of clearing that would constitute a reliable barrier would occupy years, involve heavy expenditure, and the attainment of results of practical value would be very uncertain. The creation of a barrier of any description is open to the objection that the expenditure for maintenance would need to be continued indefinitely as an annual charge, and if it took the form of a cleared strip through the forest, this charge would be by no means inconsiderable, owing to the vigour with which the common Brachystegias grow out again from their stumps.

One form of local clearing has, however, been considered worth a trial. During the latter part of the dry season the bulk of the forest in certain localities is leafless. This is the case with Mopani forest everywhere. The more prevalent type of forest, known to the Matabele as "gusu," consisting of various species of Brachystegia, of which the well-known Msassa (*B. Randii*) is a familiar example, varies in its habit with the underground water supply. Where this is ample, as at Salisbury, the trees lose their foliage, as elsewhere, late in July, but the young leaves grow out immediately, with the result that the trees are practically always shady. Over great stretches of the sand veld, however, the trees remain leafless, as a rule, from July to November. Along the banks of rivers and dry water-courses, around the edges of vleis and on "ant heaps" a different kind of vegetation is found, consisting of trees that remain evergreen all the year round. During the period when the rest of the forest is leafless the tsetse fly is more or less confined to these shady places, and appears to be dependent upon them for its continued existence. In order to prove or disprove this dependence, an isolated vlei in the Mafungabusi district has been selected. This vlei is extremely heavily infested with tsetse in the latter part of the dry season, and it is intended to cut down all the evergreen trees surrounding it, and to observe the effect on the prevalence of fly. The operation is to be carried out in August of the present year, and if successful in ridding the immediate neighbourhood of the fly, it is likely to prove of value in certain parts of the country where conditions are favourable. Conditions in many parts where fly occurs do not,

however, permit of employing this method, on account of the too extensive distribution of trees and shrubs shady in winter.

The foregoing remarks appear to exhaust the consideration of possible measures with a view to modifying the habitat of the tsetse, and we now have to consider the possibility of interfering with its food supply. This, of course, involves the old controversy concerning the dependence or otherwise of the tsetse *G. morsitans* on "big game." In spite of the enormous importance of this species of tsetse throughout a large portion of Africa, this dependence has not yet been proved or disproved. Some of the arguments in favour of such dependence are well known, namely:—(1) the observations of the early hunters and explorers as to the association of the two forms of life; (2) the disappearance of the tsetse before the rifle of the hunter in many parts of the Northern Transvaal during the past century; and (3) the apparent effect of the rinderpest epizootic. In addition, we have in this Territory the apparent effect of shooting in the Hartley district, which was followed by great reduction, though not complete elimination of both game and fly, and the significant fact that the extension of the fly during the past ten years has been confined to country well stocked with game. It is not necessary to elaborate the whole argument in the present paper, but the foregoing should indicate that there is at least something more than a *prima facie* case against the game. In the Transvaal, considerably before the rinderpest epizootic, the tsetse fly was regarded as a "temporary and ephemeral scourge,"* destined to disappear with the big game, as indeed actually occurred. A material difference between the development of Southern Rhodesia and the Transvaal has been that in Southern Rhodesia the game has been preserved, whilst in the early days in the Transvaal this was not the case. We are confronted, therefore, with the important question as to whether or not preservation of game lies at the root of our present troubles with tsetse fly, and it is certainly time that a decision was reached on this point.

The only method of gaining the desired information lies obviously in the removal of game from a piece of country infested with tsetse fly. This could doubtless be effected at great expense, by enclosing a selected area with a sufficiently strong fence and driving out or destroying the game within. This would constitute a purely scientific experiment, without the prospect of any immediate tangible results. It is to be noted, however, that the basis of the argument in favour of tsetse being dependent upon game, apart from the fortuitous intervention of rinderpest, rests upon the effect of hunting, and in the event of a positive result to the experiment mentioned above, the practical application of the information gained would need to lie in recourse to the rifle. The practical aspect of the problem, therefore, consists in testing the indirect effect of hunting game on the prevalence of tsetse fly.

The throwing open to free shooting of part of the Hartley district has apparently had very beneficial results, but in spite of the com-

*F. B. Fynney, 1878. *Proceedings of the Royal Geographical Society,* vol. xxii.

paratively large white population in the district, the substantial reduction of both game and fly occupied a number of years. A further experiment in suspending the game laws in respect to a considerable extent of country between the Umniati and Sengwe Rivers in 1914 resulted in a complete fiasco, owing to the fact that hunters adopted the practice of camping on the edge of the open area, and poaching in neighbouring fly-free country. The fly-infested areas were almost altogether neglected, except by hunters in pursuit of elephant, who shot only enough game for food. The deduction from this experience is that the throwing open of selected pieces of country to shooting is not calculated to effect its object, unless (1) it is possible to patrol the boundaries sufficiently to prevent poaching, and (2) the natural situation of the selected area is favourable to game elimination, as in the Hartley district. Hunters, naturally enough, will not shoot in fly country if game is available in fly-free areas close by, especially as these conditions afford an opportunity of deceiving the police as to the source of the meat, hides and other trophies in their possession.

In any case, in order to obtain quick results something more than suspending the game laws is needed, and the idea of organised hunting under the control of the Government is naturally suggested. A glance at the map will shew that the cases of trypanosomiasis on the Gwaai River can only have been due to the presence of tsetse fly towards the Shangani, and as only a limited portion of the latter river, including its tributaries on both sides, is infested, the situation is decidedly favourable for an experiment in game elimination, with possible tangible results. This area was, therefore, selected for the organised shooting operations. At the same time it was considered desirable that game should be reduced as far as possible in the area apparently threatened with invasion, namely, the country lying between the Gwaai River and the railway line. This, therefore, has been thrown open to free shooting, and it is hoped that its accessibility and the fact that the boundaries can be patrolled in an efficient manner will operate in producing satisfactory results.

The foregoing is judged to constitute an effective reply to the greater part of the criticism which the undertaking appears likely to evoke. The facts on which hopes of a favourable result are founded have been stated, and these facts constitute the justification for the destruction of the game, which is, as may be seen, strictly local. It is, as a matter of fact, probable that far more game will be driven away from the shooting areas than will actually be destroyed. In any case, the sentiment which surrounds these animals cannot protect them from standing their trial on the charge of being deleterious to the welfare of the Territory, and the destruction of a limited number appears necessary to this end. If found guilty, there is, of course, no alternative to their eventual elimination from the fly-infested areas.

There is, however, one criticism of the undertaking which has not been dealt with in the present paper, namely that the shooting operations, in scattering the game, may possibly tend to scatter the fly into areas which are free from the insect at the present time. Without going too deeply into the details of the question, it may be stated

in reply that the writer is not aware of any authentic record of this having occurred, and that it is contrary to what is known of the habits of the tsetse. It may seem a logical deduction that, when deprived of food in one locality, the fly should seek it in another, but as far as observations in this Territory go, the fly's attachment to its birthplace appears to be its strongest instinct. It is well known that the male tsetse will follow human beings, and presumably game, up to ten miles, but all evidence to date indicates that they eventually return to the spot from which they were carried. The female flies appear to seek animals only for the purpose of feeding, and the distance they are carried is apparently decided by the time occupied in effecting their object; on a large buck this would not be likely to occupy more than a few minutes. Apart from these considerations, it is quite certain that the tsetse does *not* follow the big game in its movements about the country, for the reason that, if it did so, the remarkable phenomenon of fly belts would not occur. The strict localisation of the tsetse was one of the first things to be recorded concerning it, and is obviously dependent upon the fact that the fly does not wander, at least beyond certain narrow limits. This, of course, does not eliminate the possibility of wholesale migration under some hypothetical stimulus of rare occurrence, such as starvation, but such movements, had they occurred, could hardly have escaped attention. Moreover, we have had experience in recent years of the destruction of game both in the Suri-Suri fly belt and near the Umniati, and in neither case did the fly exhibit any tendency to seek new localities. On the contrary, the range of the insect appeared to be gradually restricted with the reduction of the game.

It is judged, therefore, that the risk of spreading the fly by scattering the game is negligible, more especially as the steps taken with a view to reducing the number of large animals in the threatened area, by throwing it open to free shooting, are calculated to check any tendency to migration in this direction, and the organisation of the official shooting is such that game, etc., from the fly-infested portion will tend to migrate in a north-easterly direction, that is to say towards the main part of the fly area.

In conclusion, it may be pointed out that in reducing the numbers of the larger mammals we are reducing the only known reservoir of the organisms which cause fly disease of stock, namely *Trypanosoma brucei* and *T. pecorum*, both of which may be conveyed by the common tsetse fly, *Glossina morsitans*. As the tsetse fly is only deadly in proportion to its ability to inoculate animals (and possibly human beings) with one or other of these diseases, it is obvious that, although it is not perhaps proved to demonstration that no other representatives of our fauna harbour these organisms, nothing but benefit can result from the reduction or elimination of the known (and almost certainly the main) reservoir of infection.

Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia.

By R. C. Simmons.

PART I.

The term "feeding cattle" may be taken to mean the provision and supply of food in mangers or cribs erected in stalls, sheds, paddocks or yards, in order to supplement or substitute the food which cattle may be allowed to obtain for themselves by grazing at will, either on the ordinary veld or on cultivated pastures. The principal reasons for feeding cattle are: (a) for maintenance, that is merely to ensure the cattle remaining in normal health when the food obtainable on the veld is insufficient for this purpose; (b) in order to ensure the continuity of growth and early development in better class young stock; (c) for the fattening of slaughter stock; and (d) for the production of milk.

In order to approach the subject properly, to understand the methods applicable in the various circumstances above referred to, and in order to be able intelligently to adapt such crops as the farm produces best to the needs of the cattle, it is necessary at the beginning to make a short survey of the principles underlying animal nutrition. The animal body contains on an average about 52 per cent. of water, 16 per cent. protein, 22 per cent. fat and 5 per cent. of mineral ash. The actual amounts vary according to the condition of the animals. These substances are found in varying amounts in farm foods, and are extracted from them by the animal in the process of digestion for the building up or the repair of its tissues and the production of milk and fat.

Farm cattle feeds may be divided into two classes, namely: (a) roughage, such as hay, silage, maize fodder, pumpkins, majordas, and the cheaper and more bulky foods generally; (b) concentrates, such as grain or grain and oil mill porducts, which include all the less bulky and usually more expensive foods. In both classes of feed the three main substances required for the building up of the animal body are contained, that is protein, carbohydrates and fat, and in addition, all feeds contain water in a greater or less degree and a proportion of mineral salts.

Proteids is the name of a group of nitrogenous (*i.e.*, containing nitrogen) materials necessary for the formation of lean flesh, blood,

tendons, nerves, hair, horns, and the casein and albumen of milk. Carbohydrates is the name of a group of materials which do not contain nitrogen. This group is again sub-divided into two kinds, namely, nitrogen-free extracts (such as starch, sugar, gums, etc.) and crude fibre. They are either stored up in the animal body as fat or are consumed in the body to produce heat and energy. Fat is soluble in ether, and is therefore sometimes referred to as ether extract. It is also free from nitrogen; it serves the same purpose as carbohydrates, but 1 lb. of fat is worth 2.2 lbs. of carbohydrates. In making calculations the fat is multiplied by 2.2 and the result is called the "carbohydrate equivalent." A suitable food is one in which the flesh-forming materials and the fat are in such proportion and condition that the animal may assimilate them in accordance with its needs and without waste. The proportion of these two groups of materials to one another in a food or mixture of foods is what is called the "nutritive ratio." When it is stated that the nutritive ratio of a food is 1:6, it is understood that for one part of digestible flesh-forming substance contained in it there are six parts of digestible fat and energy-forming material.

When selecting a feed for any class of cattle it is the proportion contained in it of these two groups of materials by which one will be mainly guided. It may usually be taken for granted that the mineral salts will be present in sufficient quantity, but this point will be dealt with later. Whilst being mainly guided by the above consideration, it is perhaps needless to say that in practice the cost and marketability of any particular food are very important factors; and further, the suitability, palatability, moisture and bulk of the food must not by any means be left out of account.

It will be readily understood that a food of any particular nutritive ratio will not be equally suitable for all classes of cattle and for all purposes of feeding. Young and growing animals, for instance, make a much larger demand in proportion to their size on the flesh-forming portions of their food than do mature cattle. On the other hand, mature or nearly mature cattle require these materials, as it were, for repairs only, and not appreciably for new construction, whilst they are able to consume a large quantity of fat and heat-producing material to advantage. A milch cow requires food first for its own maintenance; and secondly for the production of milk. The second requirement will vary considerably with the maximum quantity and quality of the milk which the individual animal is capable of producing under the most favourable conditions.

It is neither recommended nor expected that the average busy farmer will provide himself with elaborate analytical data, and proceed to mix his cattle foods as though he were making up chemical prescriptions. Nevertheless, the cattle owner whose experience of feeding is not extensive is earnestly recommended to give attention to the chemical composition of foods. Apart from the many published works on animal nutrition which are available to him at a reasonable cost, there is always the Agricultural Department to whom he can apply for assistance in the composition of feeds or analyses of local foodstuffs, and for the explanation of any point which his previous training does not enable

him to understand. By approaching the subject in this way, combined with daily practice and intelligent observation, he will soon acquire a sound working knowledge of the feeding value of the foods available to him and of the requirements of his cattle.

Having grasped the main principles governing the subject under discussion, one has to consider how best to apply them to the ordinary business of the farm. On many holdings it is necessary to conserve a certain amount of feed during the summer months in order to supplement the winter veld merely for maintenance purposes, or perhaps, it might be said, in order to ensure continuity of growth and to prevent that check to development and strain on the constitution of the young animal which are bound to occur under natural conditions, if for any reason the winter veld is unusually sparse. Veld fires, excessive drought, over-stocking or natural poorness of the grass may make feeding necessary. It may perhaps be pointed out here that throughout this article the writer has in mind the general farmer, not the rancher. It is further taken for granted that the intelligent farmer will endeavour to keep a better class beast (not necessarily high grade), and that he will endeavour to provide against any of his cattle, and specially his young stock, suffering from want of proper nutrition during the winter months.

Let us consider first the case of the ordinary young grade stock up to, say, two years, on a farm on which experience has taught the owner that such stock needs just a little assistance from about June until about the end of October—five months. The financial side of the question will compel the use of the cheaper feeds. The animals will pick up a great deal of their natural requirements if properly herded or allowed to roam at large, but they will probably not get enough, and what they do get will be too dry. It has been shewn that the animal body contains over 50 per cent. of water; this is obtained partly from the water taken as such, and partly from the moisture contained in the food. In the very dry months of the year, when there is a tendency to greater evaporation of the body, the moisture in the herbage is very low. The first thing to attend to, then, is a supply of clean pure water, so that the animals will drink as much as their systems require, and not content themselves with just sufficient to allay the discomfort of thirst, as they will if only dirty and impure water is available.

Amongst the cheaper foods which it may be possible to afford for the class of cattle under consideration are the following, enumerated more or less in the order of cheapness:—Veld hay, maize stover, ensilage, Napier fodder, majordas, pumpkins, sweet potatoes. Without going into exact calculations, it may be stated that, on an average, beasts ranging from eight to 24 months old, grazing all day, will be the better during the winter months for a supplementary daily ration, containing some moist food if possible, but containing also 12 lbs. of solid matter and having a nutritive ratio of about 1:7 or 1:8. This is rather poorer in flesh-forming material than most authorities advocate, but foods rich in protein are usually difficult to provide economically in this country and cannot be afforded for the more ordinary class of stock.

In order to arrive at a correct ration, the help of analytical tables

is needed. It has not been found possible to compile a comprehensive table of foodstuff analyses in Southern Rhodesia, but it may be assumed that such analyses as are published in American, Australian and other works on cattle feeding will be a sufficiently correct guide for practical farm purposes. The analyses of foods peculiar to this country, and of which no mention is made in the works published in other countries, may usually be obtained on application to the Department of Agriculture. Analyses of some of our commoner foodstuffs are published herewith.

As a trial ration we will take 10 lbs. of veld hay and 10 lbs. of ensilage, and set them down as follows:—

Food.	Weight.	Dry matter.	Protein.	Carbo-hydrates.	Fat.	Nutritive ratio.
Veld hay	10	8·75	·30	4·18	·140	
Ensilage	10	2·64	·125	1·42	·070	
	20	11·39	·425	5·60	·210	1 : 14 approx.

The calculation is as follows:—Multiply the total fat by 2.2, add the carbohydrates, and divide the sum of the two by the total of the protein, thus—

$$\frac{\cdot 210 \times 2\cdot 2 + 5\cdot 60}{\cdot 425} = 14 \text{ approximately.}$$

This is a very wide ration; in other words, the fat and heat-forming substances are much in excess. Now, if the cattle thrive, as they probably will, on this ration, which is cheap, it may be assumed that the balance of the flesh-forming material is being found in the veld. If they fail to thrive, some protein must be added, especially for the younger ones, if at all possible. We will try 1 lb. of ground nuts per beast per diem in addition to the above, thus:—

Food.	Weight.	Dry matter.	Protein.	Carbo-hydrates.	Fat.	Nutritive ratio.
Former ration	20	11·39	·425	5·60	·210	
Ground nuts	1	·893	·429	·228	·069	
	21	12·28	·854	5·828	·279	1 : 7·5

We find that ground nuts, being highly nitrogenous, have corrected the ration, and, as before indicated, even should they be too expensive to

give to the older and stronger animals, they will repay for feeding to the younger ones. It would probably only be for a couple of months that the ground nuts would be required, which will work out at less than one bag per beast, or say 5s.

Good well-cured maize stover may replace the hay, whilst pumpkins, majordas, Napier fodder or sweet potatoes may be substituted for the ensilage. Either of these mixtures is very poor in protein, especially if sweet potatoes are used. The succulence, however, appears to have a beneficial effect on digestion, and, unless the veld grass is very sparse, the results of such a feed are usually satisfactory. In the event of the veld grass being very scarce, the ration of stover should be doubled, as the ration as indicated is very deficient in solid matter.

The question of the supply of mineral salts has been touched upon, and, although these are usually taken as being present in sufficient quantities in most foods, it would appear that on some Rhodesian soils such is not the case. All cattle should be periodically supplied with common salt. On some of the granite soils young stock appear to be deficient in bone. To correct this, the following lick has been found to be satisfactory:—Salt, 100 lbs.; powdered sulphate of iron, 8 lbs.; sterilised bone meal, 20 lbs.; lime, 15 lbs.; mixed and put in a clean trough protected from the weather, where cattle may have access to it at will. There are other recipes for this, but the one given is as cheap and as satisfactory as any. It may be here mentioned that, as common salt is an expensive item, a saving will be effected by supplying it to cattle in a covered trough, so that they may take it at will. They will waste less and eat less than if given only at intervals. The theft of the salt by natives may be prevented by adding a little Kerol to it, which will make it distasteful to them, whilst it will not deter the cattle, and, in fact, will often have beneficial results.

The following analyses of our commoner foodstuffs will, it is hoped, be of assistance to the reader:—

Digestible Nutrients contained in 100 lbs. of our Commoner Farm Foods.

Note. These data are derived from investigations carried out and published in the United States of America by Messrs. Henry and Morrison. As applied to foods grown in this country, they must be regarded as approximately correct only.

Feeding stuff.	Total dry matter.	Digestible nutrients.			Nutritive ratio.	Remarks.
		Protein.	Carbo-hydrates.	Fat.		
	lbs.	lbs.	lbs.	lbs.		
Maize	84·9	7·6	66·9	4·6	1 : 9·4	Average for various kinds.
Corn and cob meal ...	78·1	6·1	63·7	3·7	1 : 11·8	
Velvet bean seed ...	80·8	18·1	50·8	5·3	1 : 3·5	
Peas	90·8	19·0	55·8	0·6	1 : 3·0	
Buckwheat	87·9	8·1	49·7	2·5	1 : 6·8	
Kaffir corn	88·2	9·0	65·8	2·3	1 : 7·9	Rapoko is about the same value; also Inyouti, but the latter contains more fat.
Ground nuts	94·0	24·1	14·9	40·4	1 : 4·4	
do. unshelled	93·5	18·4	15·3	32·6	1 : 4·8	
Linseed...	90·8	20·6	17·0	29·0	1 : 4·0	
Sunflower seed ...	95·5	23·3	17·0	33·9	1 : 4·0	
do. with hulls	93·1	13·5	38·1	20·3	1 : 6·2	
Maize ensilage ...	26·3	1·1	15·0	0·7	1 : 15·1	
Pumpkins	8·3	1·1	4·5	0·5	1 : 5·1	Majordas are about half as valuable.
Sweet potatoes ...	31·2	0·9	24·2	0·3	1 : 27·7	
Potatoes	21·2	1·1	15·8	0·1	1 : 14·5	
Mangels	9·4	0·8	6·4	0·1	1 : 8·2	
Cabbage	8·9	1·9	5·6	0·2	1 : 3·2	
Green maize stalks ...	21·9	1·0	12·8	0·4	1 : 13·7	
Green barley	23·2	2·3	11·5	0·4	1 : 5·4	
Green rye	21·3	2·1	12·2	0·5	1 : 6·3	
Lucerne	25·3	3·3	10·4	0·4	1 : 3·4	
Green maize leaves and tops	15·9	1·3	8·4	0·5	1 : 7·3	
Green velvet bean fodder	17·9	2·7	7·2	0·4	1 : 3·0	
Skim milk	9·9	3·6	5·1	0·2	1 : 5·0	
Green oats	26·1	2·3	11·8	0·8	1 : 5·9	
Good green veld ...	29·7	3·6	14·5	0·9	1 : 4·6	
Wet brewers' grain ...	29·8	5·2	11·1	1·9	1 : 3·0	
Ground nut vine ...	78·5	6·6	37·0	3·0	1 : 6·6	
do. with nuts	92·2	9·6	39·6	8·3	1 : 6·1	A moderate crop of native ground nuts fed in this way is satisfactory.
Velvet bean hay ...	92·8	12·0	40·3	1·4	1 : 3·6	
Corn fodder	77·8	2·9	44·1	1·3	1 : 16·5	Average between very dry and well cured.
Mixed veld hay, good	87·2	4·3	44·3	1·2	1 : 8·3	Good, dry veld would be about the same.
Oat hay	88·0	4·5	38·1	1·7	1 : 9·3	
Lucerne hay	91·4	10·6	39·0	0·9	1 : 3·9	
Dried brewers' grain...	92·5	21·5	30·5	6·1	1 : 2·1	
Wheat straw	91·6	0·7	35·1	0·5	1 : 51·7	

In choosing a mixture of feeds, as a general rule those feeds having a narrow nutritive ratio, such as 1:3 or 1:4 for instance, should be mixed with those having a wide nutritive ratio, such as sweet potatoes, the ratio of which is 1:27.7. It is perhaps unnecessary to state that the constituents of any given weight of a given feed may be calculated from the above data by means of a simple proportion sum, thus:—If there are 7.6 lbs. of protein in 100 lbs. of maize, in 5 lbs. of maize there will be 7.6 ÷ 100 x 5 lbs. = .35 lb.

It is proposed to continue this article in subsequent numbers of the *Journal*, and the above data will be referred to.

Marmalade.

The following old-fashioned recipe shews an easy way of making marmalade, and if the directions are carefully carried out, the marmalade is delicious:-

Take 10 sweet oranges the day before the marmalade is required, and wash them well. Put them in cold water and boil until tender enough to be pierced with a straw. This usually takes from 3 to 4 hours. Save the water in which they have been boiled. Take out the oranges, and when cold cut up each into 4; press knife through fruit so as to get rid of pips, and cut up skin into pieces as fine as desired. Next day make syrup, using 1 quart of the water and 6 lbs. of sugar. Boil until clear. Put in fruit prepared the previous day, and boil fast until it sets, which will require from 1½ to 2 hours.—*S.A. Fruit Grower*, May, 1919.

Tobacco Seed Beds.

By H. W. Taylor, B.Agr., Tobacco Expert.

The production of strong, healthy seedlings for transplanting is the first step in tobacco production. This work is unfortunately looked upon by many tobacco growers as being elementary, and they therefore do not give their seed beds the attention required. In point of fact, the production of the necessary quantity of strong, healthy seedlings is one of the most important steps in tobacco growing, and failure in this operation often leads growers into difficulties. Every season there are a number of tobacco growers who do not produce sufficient transplants for their requirements, and thereby suffer considerable loss.

On account of the small size of tobacco seed, the seed beds must be brought into a fine tilth in order to secure proper germination. Tobacco seed store up only small amounts of plant food, and for this reason the young plants are soon forced to draw their food supply from the soil. For this reason tobacco seed beds should be in a high state of fertility, and the soil should have an abundance of available plant food at the time germination takes place, and a sufficient store to maintain a steady growth of the seedlings until they are ready for transplanting into the field.

Types of Tobacco Seed Beds.—The type of seed bed used depends on the climatic conditions of the particular country in which tobacco is being produced. When the growing season is short and the spring months are subject to low temperatures, the tobacco seedlings are grown in greenhouses, or in cold frames covered with glass. Fortunately the climatic conditions of Rhodesia render either of these expensive types of seed beds unnecessary. The open frame type of seed bed fulfils the requirements for this climate, and is considerably less expensive, besides being simple in construction.

Selection of Site.—The area selected for seed beds should, if possible, be well sheltered from the prevailing winds. Strong winds dry out the surface of the soil, which necessitates additional work in watering, besides being harmful to the young tender plants. Water is the first requisite for producing tobacco seedlings in Rhodesia, and for this reason the seed beds should be located near a permanent supply of water. When possible, the seed beds should be near the homestead, so that they can be constantly under the supervision of the grower. Large trees should not be too near the seed beds, as their roots would

deprive the plants of food and moisture, and might interfere with the growth of the seedling by casting too much shade.

The seed beds should be located so that the plants will receive the maximum amount of sunlight, especially the sunlight of early morning. Rawson* has shewn that the early morning sunlight is essential for the proper growth of certain plants, and the writer has noticed in many instances that this is true of the tobacco plant. For this reason an eastern or north-eastern exposure is best for tobacco seed beds.

If the site selected is exposed to the winds, an artificial shelter should be erected. This can be constructed from the material on the farm by using long grass or maize stalks supported by poles and posts.

SOIL.—The soil used for tobacco seed beds must be well drained. If the soil becomes saturated with water the plants do not make satisfactory growth, and are also more liable to be attacked by fungus diseases. The very early beds can be located on the border of a vlei, but such locations are to be avoided for later sowings for the reasons stated above. The most suitable soils for seed beds are sandy loams and alluvial soils which have good natural drainage. The soil should be fertile, and have a plentiful supply of humus.

If no proper soil can be found on a suitable area, much can be done to change the texture of the soil so that it may be used for seed beds. Should the soil be too light and friable, a few wagon loads of heavier soil can be spread over the surface of the site and thoroughly mixed with the soil. This will in many cases produce the desired result. If the soil of the site is too heavy and stiff, a similar application of sand will render such soils more friable and suitable for tobacco seed beds.

On many farms the soil near the only available water supply is inclined to be too wet. In such cases the only alternative is to provide drainage. If the land does not have sufficient fall, this may be extremely difficult, but a site can usually be found which can be properly drained. Time and money should not be spared to provide proper drainage, as the year's supply of plants depends on the proper construction of the drains. Generally speaking, open drains should be cut around the four sides of the site, and in addition a channel must be cut from the lowest corner to lead away all drainage water. Small drains are usually of no practical value, and are a waste of time and money. Open drains should be at least 4 feet wide, and of sufficient depth to thoroughly drain the site selected for tobacco seed beds. Negligence in the matter of drainage is annually the cause of failure in the production of tobacco seedlings on many farms in Rhodesia. This applies to Turkish seed beds more particularly, as they are sown later in the season.

Tobacco seed beds should not be made continuously on the same soil. When the same site is used annually for seed beds the plants are more liable to the attacks of insects and fungus diseases, and the soil is rendered less suitable through the heavy applications of water and the annual sterilising. New land is preferable, as weeds and grass

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are less troublesome, and the plants are not so much subject to the attacks of insect pests and fungus diseases.

PREPARATION.—The preliminary preparation consists in clearing the site of undergrowth and rubbish, and levelling the land. When this is done, the soil should receive a liberal application of old well-pulverised kraal manure, which should be well incorporated with the soil by ploughing or spading. Kraal manure should be applied some time before the final preparation of the seed beds, in order that it may be thoroughly decomposed, and converted into humus before the beds are seeded. If the soil is stirred at frequent intervals, most of the weeds will be destroyed before the final preparation of the beds, and the remainder will be killed when the soil is sterilised.

In the final preparation the site is lined off into beds, with pathways between. The size of the beds can be made to suit the site and the convenience of the grower. Beds can be made any desired length, but it is best to restrict the width to 4 to 5 feet, so that transplants may be removed from either side without damaging those left in the seed beds. After the beds have been aligned, they should be sterilised before they are seeded.

There are several methods of sterilising the soil, but for Rhodesian conditions the open-fire method gives satisfactory results. By the burning process, weed and grass seeds are killed and insects hibernating in the soil are destroyed. The resulting ash is an excellent fertiliser for tobacco, as it contains carbonate of potash, which is the best form in which potash salts can be applied to tobacco. Also, Russell and Hutchinson have shewn by experiments that, when soils are heated to 98° C. and then moistened with water, after a few days there is an increase in the available nitrogen content of the soil.

In burning tobacco seed beds, sufficient brushwood, maize cobs or other material should be placed on the soil to thoroughly sterilise it to a depth of 3 inches. Tobacco stalks alone should not be used for this purpose, as the ash contains an excess of potash, which adversely affects germination. When the soil is properly sterilised it will have a light, dull-red colour, and will be very friable and easily pulverised. A simple and efficient test is to bury a potato about 3 inches below the surface of the soil in the seed bed, and when the potato has been cooked until the skin slips off easily the soil has been properly sterilised. The soil should not be sterilised when saturated with water; on the other hand, the best results are not obtained when the soil is extremely dry. Soil containing just sufficient moisture for cultural operations is in the proper condition for sterilising by this method.

After burning, the beds are allowed to cool, and are then enclosed with boards, bricks or sheets of iron. The unburned portions of wood and large pieces of charcoal are then removed from the surface. The seed beds are then ready for an application of fertiliser before digging them over. An excellent fertiliser can be made up of 1 lb. of nitrate of soda, 1 lb. of sulphate of potash and 2 lbs. of superphosphates, which should be applied to 10 square yards of seed bed. If these materials are not available, an equivalent amount of good tobacco

fertiliser can be applied. After the fertiliser has been applied, the soil should be dug over to the depth at which it has been sterilised. The unsterilised soil should not be brought to the surface, as weed and grass seeds would be exposed, which would give trouble later. In digging over the seed beds, care should be taken to thoroughly mix the ash and fertiliser with the surface soil. The seed beds are then brought to a fine tilth with the hand rake, care being taken to leave the surface of the beds level, both longitudinally and transversely. If the surface of the seed beds is not level, there is danger of the tobacco seed being washed from the higher to the lower portions of the bed, which causes an uneven stand of plants, and this is undesirable. After the soil has been properly levelled and thoroughly pulverised, the seed beds are ready for sowing.

Sowing.—A very common mistake is to seed too thickly. On account of the small size of tobacco seed, growers do not realise the numbers of seed contained in a given quantity. In one ounce of tobacco seed there are approximately 300,000 seeds, and an average teaspoon will hold about 25,000 when level full. If tobacco growers will keep these figures in mind, there should be a tendency to avoid this common mistake.

When shelled from the seed pods, tobacco seed contains a large amount of dust and chaff, besides a very high percentage of light inferior seeds. Before sowing, these impurities and inferior seeds should be removed by passing the seed through a tobacco seed separator. It is not expected that every grower will provide himself with the necessary apparatus for this work. Each grower can, however, send his tobacco seed to the Department of Agriculture, where it will be cleaned free of charge, but carriage must be paid to and from Salisbury. It has been definitely established by practical and experimental results that tobacco produced from heavy, well-developed seed is more uniform in size and colour and produces larger yields than tobacco grown from ungraded seed.

If properly cleaned and graded seed is used, one ounce of tobacco seed is sufficient for sowing 120 square yards of seed bed. Every farmer does not have a scale which will weigh fractions of an ounce, but the seed can be measured with sufficient accuracy with an ordinary teaspoon. In one ounce there is sufficient tobacco seed to fill an ordinary teaspoon level full twelve times. If an ordinary teaspoonful of tobacco seed is sown to 10 square yards, the rate of seeding will be approximately one ounce to 120 square yards.

In order to evenly distribute such a small quantity of seed over the given area, some substance must be used as a distributing medium. It has been found from practical experience that wood ashes and mealie meal are the most satisfactory materials to use. Both are usually at hand, and, being white in colour, they indicate plainly the evenness or otherwise of the distribution. The proportion of seed to wood ash or mealie meal is about one teaspoonful of tobacco seed to one quart of ash or meal. The seed should be thoroughly mixed with the distributing medium before sowing.

After sowing, the seed should be gently firmed into the soil to prevent washing. For this operation a plastering trowel or similarly fashioned implement can be used. Some growers give the seed beds a light dressing of clean sand or leaf mould before firming the soil. This must be carefully done, or the seed will be covered too deeply. Immediately after sowing, the beds must be watered with a sprinkling can, fitted with a finely perforated "rose," and they should not be allowed to become dry until the plants are ready for hardening off for transplanting.

TIME FOR SOWING.—No definite date can be laid down as to when beds should be seeded. Generally speaking, for early sowing, about 60 days from date of seeding the seedlings will be ready for transplanting into the field, and less time is required for later sowings.

Virginia tobacco should not be transplanted after the 15th of January, and if possible the whole of the crop should be established in the field by the end of December. It follows then that the beds to provide seedlings for transplanting during November and December should be sown from the first part of September to the middle of October. Turkish tobacco is best transplanted from the latter part of January to the end of February, so that seed beds of this type of tobacco should be seeded from the first part of December to the middle of January.

All of the seed beds should not be sown at one time, but should be seeded at intervals of about fourteen days. For Virginia tobacco sufficient seed beds should be sown at one time to provide plants for at least 20 acres, so that a sufficient area can be transplanted at one time to furnish enough ripe uniform leaf for the first curings. When this practice is followed, the several operations of cultivation and curing can be carried out in succession and labour can be used to better advantage.

The area of seed beds required depends on the size of the intended crop and the type of tobacco grown. For Virginia varieties about 20 square yards will be sufficient to provide plants for one acre, but for Turkish varieties 100 square yards of seed bed should be seeded for each acre to be grown.

COVERING.—In the early stages of growth, tobacco plants are very tender and delicate. Frost at night and hot sun during the day are both injurious, so that some covering must be used to protect the young plants from the extremes of heat and cold. Two covering materials are available—grass and cheese cloth. The latter is preferable for a number of reasons.

Grass is difficult to manipulate in order to give the seedlings the proper amount of sunlight. If the grass covering is too thick, the plants are inclined to be lanky and weak. If too thin, the young seedlings are often killed by the surface soil becoming too dry. Again, grass does not protect the seedlings from insect attacks. Some growers maintain that grass coverings are considerably cheaper than cheese cloth, but this is questionable. If the additional labour required for cutting and cleaning the grass, and for the extra work entailed in

constructing the covers and manipulating them, is taken into account, it will be found that there is practically no difference in cost. Grass coverings also often harbour the moths of the tobacco splitworm and tobacco stem borer, both of which may cause severe damage to the young plants and in some cases completely destroy the seed beds.

Cheese cloth is the most suitable covering for seed beds which has yet been found. It protects the young plants from insect attacks if properly used; it protects the young seedlings from the direct rays of the sun, and at the same time affords sufficient sunlight for proper growth. If the beds are properly enclosed, cheese cloth will keep the beds warm at night, by retarding radiation, which hastens the growth of the seedlings. This form of covering is not expensive, and will greatly assist the grower in the production of strong healthy transplants. If procurable, the writer advises every tobacco grower to use cheese cloth for covering tobacco seed beds. Should cheese cloth be unprocurable at a reasonable price, light weight, coarsely woven hessian can be used.

Care of Seed Beds.—In order to obtain satisfactory results, tobacco seed beds must be given constant care. If neglected for a few days, the seedlings may be destroyed by insects or lack of moisture, and the season's crop may be lost or seriously retarded.

The seed beds should always be kept moist, but not wet. Water should be applied with a watering can and not by irrigation. During germination and the early stages of growth the watering can should be fitted with a finely perforated "rose," in order that the seed may not be displaced or the soil washed away from the roots of the small seedlings. When the leaves of the plants are the size of a shilling, a "rose" with larger perforations can be used, and after the plants have become firmly rooted, the "rose" may be removed from the watering can in order to facilitate the work. Should weeds and grass appear in the seed beds, they should be removed, as they deprive the young plants of food and moisture, besides causing them to grow long and lanky through overcrowding.

During the early stages of growth the cheese cloth covering should remain on the seed beds during the whole of the day, being removed only during the time the beds are being watered. Later the cheese cloth is removed for a short time each morning to give the plants more sunlight, which prevents thin, weak stems. The period of exposure is gradually increased as the plants grow, and when they reach the desired size for transplanting the covering is removed during the day, but replaced at night to prevent insect injury. This procedure is necessary to harden the plants, in order that they may better withstand the shock when transplanted. After the plants are large enough for transplanting, they should be given only sufficient water to prevent excessive wilting. Just before the transplants are removed, the seed bed should be thoroughly moistened with water, so that the plants can be easily removed without injury. After all suitable plants have been removed, the beds should be again watered to firm the soil around the roots of the remaining seedlings, in order that their growth may be retarded as little as possible.

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Under certain conditions the plants in the seed beds fail to make satisfactory growth. Upon investigation it will usually be found that the lack of growth can be traced to insect pests, water-logged soil, lack of plant food or overcrowding. In the latter case the obvious remedy is to remove sufficient plants, so that those remaining will receive enough air and sunlight to produce a healthy growth. Thinning also loosens the soil, which assists soil aeration and stimulates growth. If the soil is water-logged through the application of too much water, the amount should be decreased and the soil lightly stirred. It may happen that water-logging is due to insufficient drainage, which should be provided at once. Lack of plant food is generally indicated by the colour of the plants, which usually have a sickly, yellowish appearance. When plants turn yellow through lack of plant food, nitrogen is usually the element required. This can be supplied by using nitrate of soda or fowl manure. The latter is cheaper and should be available on every farm. Fowl manure is best used as a liquid, but can be applied dry if finely pulverised. When used as a liquid manure, the mixture is prepared as follows:—Fill any suitable receptacle about half full of fowl manure and then fill with water. Allow the mixture to stand for several days, stirring same at regular intervals. After about five or six days the manure is ready for use, and should be applied at the rate of 1 gallon of liquid to 8 gallons of water over an area of about 10 square yards. After a few days a second application should be given. Fowl manure is preferable to nitrate of soda, as it contains phosphates and potash as well as nitrogen. Nitrate of soda is used at the rate of 1 pound to 8 gallons of water, and the solution can be applied immediately. The usual tobacco fertiliser, of good quality, can also be used with advantage for stimulating the growth of backward seedlings. This is usually applied broadcast over the beds at the rate of 1 pound to 10 square yards. After applying any of the above, the seed beds should be watered to wash the solutions or fertilisers from the plants to prevent the leaves from being burned. When possible, application should be made on a dull cloudy day, as such weather reduces the risk of the leaves being scorched.

Should the plants be attacked by insects, the grower should refer to Bulletin No. 140, issued by the Department of Agriculture, which deals with the insects destructive to tobacco and prescribes remedial measures.

Failure in the production of strong, healthy seedlings for transplanting almost every season causes either the curtailment of the tobacco crop or forces growers to use unsuitable transplants. Moreover, the lack of plants for transplanting at the proper time is the cause of the production of a large amount of late inferior tobacco, which would be almost unmarketable if tobacco was not in great demand at present.

There is no doubt that, if all tobacco seed beds were properly prepared and diligently cared for, a great step forward would be made in tobacco culture.

Weeds.

By C. Mainwaring, Assistant Agriculturist.

Whilst visiting farms and attending meetings of various farmers' associations, the writer has been asked many questions regarding the problems of weed eradication, and this short article has therefore been written in response to a popular demand. In addition to replying to questions so commonly asked, the writer ventures to offer a few criticisms of prevalent methods. Weeds, like other plants, grow where they can find room, and the more room a plant can find, other things being equal, the farther and more rapidly will it spread over pasture and cultivated lands.

The Mexican marigold is now a familiar feature of town commonages, waste places, and unfortunately also of cultivated lands. It shews a marked liking for ant-heaps, and it is no uncommon sight to see every ant-heap over the whole extent of a large piece of grass or fallow land completely covered with marigold.

Some of our farmers are doing good work in fighting troublesome weeds. In spite of municipal infested areas, roadsides and slovenly neighbours, their farms are object lessons in clean pasture and high-class crops. Why are others so careless about weeds? True, weeds establish themselves through no fault of the farmer, but it is his fault if they overrun the farms. Some men take up a farm in a weed-infested district, and although the farm may be infested with the worst weed known, in a few years' time it is cleaned, and the weeds completely controlled. Some farmers refuse to believe that there are weeds in their grazing land or crops, until the weeds have obtained the mastery; then they appeal to the Government to suggest remedies, and are surprised that it cannot by some short cut rid their land of the pests. Weeds not only reduce the crop, but their ejection, when they gain a foothold, is an expensive item. No doubt infection by weeds from outside sources is vexatious, but the damage would be lessened considerably if farmers would plough up less ground, cultivate more thoroughly, and inspect their veld and growing crops more often, in order to see that the forerunners of the weed army are destroyed. Prevention is better than cure, and the pulling up or the digging out of the plants before they seed is a good method of prevention.

All new countries suffer from serious invasions of weeds, because the equilibrium of nature has been broken by the removal of bush or the breaking up of veld land, and every plant makes an effort in the settle-

ment of the land and the reconstruction of competition to gain a place for itself. As mentioned above, weeds, like other plants, grow where they can find room, but room in this sense does not mean entire space vacant of plants, but rather a condition of competition in which the plant can establish itself and prosper. An area may be covered with a certain plant, and yet a species of plant of wholly different habits may thrive along with it. This is well illustrated in the growing of kaffir beans, velvet beans and pumpkins in mealie lands. If the weeds are then to be kept off cultivated lands, the land must not only be planted with some crop, but with a crop that will not allow the weeds to grow along with it.

In practice it is impossible to select all crops from plants which so completely occupy the ground that no intruder can find a foothold. But this disadvantage is readily and almost wholly overcome by means of rotation crops, one crop in the rotation destroying what weeds may have taken possession in the preceding ones. Thorough cropping of the land and a judicious rotation of crops, therefore, are conditions against which few weeds can stand, and as these are the vital conditions also of successful agriculture, it may be said that weeds are never a menace when lands are well farmed. Conversely, the serious prevalence of weeds is an infallible indication of bad farming, and anyone who has thought carefully upon this subject must be compelled to accept this statement.

The agricultural conditions of this Territory are such as to encourage such hardy intruders as Mexican marigold and black-jacks. An average of four to six bags of maize to the acre is in itself proof of superficial farming, but the chief fault of our agricultural practice is the continuous cropping with one crop—maize. This method of farming is particularly favourable to the distribution and growth of noxious weeds. Maize after maize, with an occasional barren fallow, but with no cultivated or hoed crops, gives little opportunity to clear the land of troublesome plants. There is no method of permanently checking the pest except by better farming, by which is meant not only cleaner tillage, but a judicious rotation of crops to supplement it. With this change of front will come all the benign results of a mixed husbandry, and the conservation of fertility. The writer is aware that the agricultural land of this Territory appears to be better adapted to maize than to any other product, and at present it is not the intention to specify other crops, but it is evident that a region which will grow maize with indifferent cultivation can grow other produce as well. A plant which becomes a weed is the victor in the battle with farm crops, and it speaks ill of the farmer's generalship if he is routed by the Cape gooseberry or the Mexican marigold.

Take the weedy maize lands to be seen along the railway line and consider the conditions. These weed-infested, badly farmed mealie lands have been but scratched by the plough, have never been cultivated, and naturally the maize gets a poor start. The farmer may say that the weeds have smothered his crop, but the fact is that the maize began to fail and the weeds quickly seized upon the opportunity to gain a

Mexican Marigold (*Tagetes minuta*, Linn.).

foothold, and just so long as the farmer persists in these methods will the weeds usurp the land. The agriculture of a new country is generally one-sided and imperfect, one crop usually eclipses all others, and in the absence of rotation the weeds fill in the chinks, spread themselves into half-cultivated lands, and soon threaten the one crop of agriculture like an invading army; but the older and more tilled the country is, the less farmers know about weeds.

All these remarks concerning the relation of weediness to farming are well demonstrated by the methods advised by progressive maize growers for the destruction of weeds. The growing is recommended of leguminous crops, kaffir beans, velvet beans, ground nuts, etc., so far as this can be done with profit. Weeds have always been the best friend of the farmer. They have taught him how to till the soil, and they never allow him to forget the lesson. The lesson is painful at the beginning, but for that reason it is remembered the longer.

Rhodesia Meat Packing Factory.

The Rhodesia Meat Packing Company's factory at Odzi is nearing completion, and it is expected that it will be possible to commence operations in September next. The formation of this company in August, 1917, created a good deal of interest amongst the farming and business communities, and subsequent developments culminating in the erection of the factory have been closely followed. We desire to say that we consider the enterprise of the promoters of the company highly commendable, and we trust that the objects for which it was inaugurated will be achieved. The primary aim of the company is to provide a market for the surplus cattle of the country, thus allowing stock-owners to cull their herds and so help forward the work of improving the quality of their animals. That there is ample material for the factory is evident by a reference to the statistical tables which appeared in the June number of the *Agricultural Journal*, where the total number of cattle in the country is given at 1,210,547. The majority of these are beasts of inferior quality, and, although better class stock will of course be accepted and paid for accordingly, it is with this type of animal that the factory will mainly operate for the present.

The question of markets is of course an all-important one, and this has been carefully studied by the company. We think there is little cause for fear that, providing the quality of the canned article is good and the price reasonable, a ready market will not be found in Europe, for the next few years at any rate, for all the meat that the factory can preserve. In this connection we understand that special rates have been granted by the railway and shipping companies, and these concessions will materially assist in enabling the company to compete in the markets in which it is intended to operate. A certain amount of the output will go to the Union, and the company hopes that a useful connection will be opened up with our southern friends.

The company is registered as a limited liability company under the Companies Ordinances of 1895 and 1907, and the nominal capital is £100,000 in £1 shares. Of this amount 56,000 shares were issued, and all have been taken up. The amount of 10s. per share has been called up, and the balance can be paid for either in stock or cash.

The company is to be worked on a co-operative basis, and, after the usual capital charges have been met and provision has been made for the payment of a dividend, any other surplus is to be divided *pro rata* amongst the shareholders supplying stock to the factory, according to the value of cattle sent in.

The following are the directors of the company:—Messrs. O. C. Rawson (chairman), E. E. Homan, A. W. Partridge, J. Meikle, E. Scott, J. Struthers, J. Buchanan, W. M. Longden, Col. Leonard and Major Jesser Coope.

The memorandum of association gives the company power to operate in all the various branches of the meat industry, but for the present it will confine its attention to preserving meat and producing by-products such as fertilisers, tallow, edible fats, neatsfoot oil and meat extract.

The factory is situated on the railway line about a mile and a half east of Odzi. The company has acquired about 4,000 acres of land, and this will be utilised for the purpose of maintaining a sufficient stock of cattle at hand to enable the factory to work continuously. There has been some difference of opinion as to the suitability of the site for a canning factory, but the company holds the opinion that it is essential from an economic point of view that the factory shall be as near as possible to the port from which the products will be shipped, while a reference to the map will shew it is in a favourable position to draw stock from almost any part of the Territory. The site from a working point of view is eminently suitable, for an ample water supply is available from the adjacent Odzi River, which can be pumped into reservoirs and distributed by gravitation to various parts of the factory, while there is enough fuel on the property to last for several years.

All cattle received at the factory will be graded as follows:—

No. 1 Grade.—Oxen in prime condition.

No. 2 Grade.—Cows in prime condition, and oxen not up to first grade standard.

No. 3 Grade.—Bulls and stags in prime condition, and cows in medium condition.

No. 4 Grade.—All cattle not fit to be classed in grades 1, 2 and 3.

All cattle will be weighed upon arrival at the factory, and cash payments will be made for live weight at ruling market prices in Rhodesia. Under no circumstances will the company be responsible for cattle sent to the factory unless the owner has received instructions from the manager to forward them, and any cattle so forwarded will be held solely at the owner's risk and expense. The company pays railage charges on all stock accepted by it, and these do not form a charge against the owner. Stock-owners who wish to drive their cattle to the factory may do so, and in such cases a driving fee will be paid to the farmer. Farmers may appoint their own agents to witness the grading and weighing of stock, but it is requested that the names be notified to the manager of the factory.

The factory consists of two separate buildings:—(1) the general canning works, and (2) the by-products works, where the boilers and engines are housed. The works are built of brick made on the property, and the foundations and floors are laid with concrete. The interior departments consist of the killing or "pithing" pen, adjoining which is the slaughter pen; chilling room, with cooling loft; canning room; packing room; tin shop; extract room; tallow room, with upper and lower floors; manure room; boiler and engine rooms.

The walls of the slaughter house are 20 feet high, and the chamber is therefore cool and specially adapted for the treatment of meat in this climate.

In each department ventilation and hygiene have received special attention, while the drainage arrangements are on the most up-to-date principles, all the fat running on the floors and through the drains being intercepted and saved.

The factory, when completed, will be capable of dealing with 40 beasts per day, but the building is so constructed that at very small expense this capacity can be doubled. Provision is also made for freezing the beef when conditions warrant such treatment, and here again the necessary adjustments can be made at a moderate cost.

One experimental house in *pisé de terre* work is nearly completed, and this has satisfied the board sufficiently to induce them to adopt this type of building to house all the white employees.

The natives will be housed in a compound situated about a quarter of a mile from the factory, and this will be divided into married and single quarters.

A spur from the main line is in course of construction, and this will bring the cattle into the yards, where they will be detrained. From here they will be driven along a race to the scale, which is one of Avery's latest models, and weighed and graded. The owner or person bringing in the cattle will then receive a ticket on which the grade and weight are endorsed, and this he cashes at the factory office. It will

be recognised that by this procedure the owner of the cattle receives full benefit for the condition in which the beasts are upon arrival at the factory.

After the cattle are weighed and graded, they are sent out to graze, a sufficient number being retained in the kraals for the following day's killing.

From the killing yards two beasts at a time are driven into the "pithing" or killing pen, where a slaughter man "piths" the animals, the *coup de grace* being administered by a chisel-shaped spear, which severs the spinal cord, the process being quite a painless one. From the "pithing" pen the animal is drawn by means of a windlass to the bleeding board, where it is bled. The blood is collected by means of a drain and saved for manufacturing into a fertilising compound. The carcase is now drawn on to the dressing board, where it is flayed. All the internal fats are sent to the by-products department for treatment, while the hide goes to the hide room. After the carcase is flayed it is divided into sides, and these are hoisted on to a set of overhead rails, where, by means of roller hooks, they are kept hanging until the meat has cooled. The sides now travel along the overhead track into the freezing room, where they are thoroughly chilled and kept until required by the preserving department.

Coming from the freezing room, the carcase is weighed and then taken over by the "boners," who separate meat, fat and bones. The fat and bones are sent to the by-products department for treatment, and the meat is cut into pieces of from 4 to 5 lbs. and put through a slicing machine, which cuts it into cubes of about an inch. From here it is taken to the "scalds," where it is parboiled, and the liquid in which the meat is immersed is conveyed to the extract room for the production of meat extract. The meat, after being parboiled, is cooled and placed in pickling tanks, in which it is cured. This process occupies about eight hours.

The pickling tanks call for some passing notice, for they are constructed on the latest and most hygienic principles. They are made of brick, plastered and finished in Keen's cement, and measure 6 by 5 by 4 ft., being a great improvement on the old system of wooden tanks generally in use.

After curing, the meat is again cooked in special "scalds," and then by means of hoists placed on to the draining table. It is then passed on to the trimming table, where all fats and gristle are removed. The beef is now put on to a scale, where the correct amount for a tin is weighed out. This portion is then put into a filling machine, which automatically places it into a tin. It might be mentioned that before the tin is used it is thoroughly washed and sterilised by means of a specially constructed steam and water spray.

From the filling machine the tin of meat is passed on to the podging table, where it is "podged" and cleaned. It is then check-weighed, in order to make sure that the correct weight is in the tin.

Meat Packing Factory, Odzi.

The next process in the evolution of the canned product is the capping, which is done by a machine which solders the cap on to the top of the tin.

From the capping machine the tin of meat is taken to the retorts, where it is first of all heated to form a vacuum, and afterwards sterilised in order to kill the putrefactive germ in the meat.

In order to overcome possible carelessness on the part of natives, the retorts are controlled by means of automatic self-recording gauges, which enable the management to be absolutely certain of the temperatures and pressures the tins have been subjected to—very important matters in this operation.

The product is now ready for consumption, and all that remains to be done is to varnish the tin, label it and place it into a case. This work is done in the packing room, from where the cases are loaded direct on to railway trucks, which are waiting immediately outside on the railway spur.

All the tins are made in a special department, large stocks of tin plate being stored for the purpose. The whole of the machinery is automatic, and it is capable of turning out round or square tins, from the large 6 lb. size to the familiar 12 oz. "bully beef" tin. This machinery is of the very latest pattern, and is capable of producing 30,000 tins in one day.

The liquid from the "scalds" is drawn into the extract room by means of a centrifugal pump, and after it is filtered it is carried into two evaporating tanks, where the liquid is reduced to a certain density. From these tanks it is run off into two porcelain-lined finishing pans, where it is gradually worked into extract of meat. The finished article is then packed in 56 lb. tins, and is ready for export.

The blood from the slaughtering room is conveyed to the by-products department in trucks, where it is first congealed by means of steam, and then put through a centrifugal drier, by means of which the bulk of the moisture is removed. The residue is then taken to the manure room, where it is further dried and put through a disintegrator, finally coming out as pure blood manure.

The internal fat from the slaughter room, and the bones and body fat from the carcase in the boning room, are also conveyed to the by-products department, and placed in two large digestors, where they are subjected to steam pressure, and the fat in the form of tallow drawn off. The residue is taken to the manure room, where it is put through the drier and the disintegrator, coming out as bone manure. It is interesting to note that the temperature to which these manures are subjected is such as to render it impossible for any disease to be transmitted through their agency.

The hoofs and shin bones from the killing department are brought to the upper floor of the tallow room, where they are heated and made into neatsfoot oil, which, as is well known, is largely used in the leather trade.

The boiler room contains two 50 h.p. Dryback boilers, which furnish the power for the whole of the factory.

The engine room is fitted with a 10-ton freezing machine, a 25 h.p. engine and a 75 h.p. lighting transformer with switchboard and all electrical accessories. From this room the whole of the motive power for driving the factory by means of electric motors is supplied, and the electricity for lighting the factory generated, as well as the cooling power used in the freezing room.

At very little additional expense the factory can undertake the curing of bacon, as practically the bulk of the present plant can be adapted to this purpose. In the tin-making plant there is the necessary machinery for jam making and the preserving of fruit, and in the event of sufficient supplies being forthcoming, it is possible that the factory will undertake this work.

In conclusion, we would mention that the manager of the factory is Mr. W. Oldham, who has been connected with the meat industry in all its branches for many years in New Zealand, Australia and Madagascar.

Agricultural Tractors.

By A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E., Agricultural Engineer.

With the exception of the large steam ploughing outfits, and a few steam tractors used almost exclusively on large estates, very little development had taken place previous to the war in regard to the production of a suitable tractor for ploughing and general farm use. Owing to war conditions and the urgent demand for increased production of home-grown foodstuffs in the British Isles and on the Continent, motor tractors of various types were evolved and came into general use. By their means large acreages have been brought under the plough in those countries in a shorter time than could otherwise have been the case.

Types of Tractors.—There are many types, principally of British, American and French manufacture, at present on the market, and each

"Fordson" Tractor Trials, Salisbury; 2-furrow Oliver mouldboard plough on new land.

"Fordson" Tractor Trials, Salisbury; 2-furrow Oliver mouldboard plough on new land.

has its special points and claims for efficiency in respect to the work for which it is designed. The various makers of machinery for mechanical tillage appear to be working along somewhat different lines, but ultimately no doubt they will reach a decision as to the types of vehicles best suited to the various uses, such as for orchards, small holdings, medium-sized farms and very large estates.

It is too early to predict what scope there is likely to be in this country in the matter of mechanical haulage for ploughing, but the subject is one upon which farmers would be advised to keep themselves informed.

THE "FORDSON" TRACTOR.—With this end in view, some details of trials with the "Fordson" tractor recently held near Salisbury will be of interest. This tractor is the product of Henry Ford & Son, the manufacturers of the Ford motor car, and a general idea of its construction will be gained from the accompanying photographs.

DETAILS OF DESIGN.—The engine, gear box and back axle are mounted as a single unit, the front axle being secured to a central trunnion bearing, under an extension of the engine crank case. The three-point principle of engine suspension thus adopted gives increased flexibility. The engine is of the four-cylinder type, the cylinders having 4-inch bore and 5-inch stroke. At a speed of 1,000 revolutions per minute, the engine develops 22 horse power (makers' rating) at the belt when running on kerosene. The engine and gears are completely enclosed. For stationary work a belt pulley can be attached, which, however, is an accessory to the standard tractor. The cooling system is on the thermo-syphon principle, with very large water jackets and tanks, used with a vertical tube radiator, and belt-driven fan. The splash system of lubrication is adopted, and circulation is maintained by oil thrown off the fly wheel by centrifugal action. The air washer is a special feature of this tractor, the air supply to the cylinders being drawn through water, thus removing all dust. The speed of the tractor is controlled by means of four gear changes operated by a gear lever. The main drive is transmitted through these gears and the differential in the back axle to the rear wheels. These wheels are 42 inches in diameter, with 12-inch rims, the latter being fitted with angle-iron plates, set to obtain the maximum adherence.

The following tractor speeds are attained through the various gear changes with the engine running at 1,000 revolutions per minute:—

Low	$1\frac{1}{2}$ miles per hour
Ploughing	$2\frac{1}{4}$,, ,,
High	$6\frac{3}{4}$,, ,,
Reverse	$2\frac{1}{2}$,, ,,

When ploughing at intermediate speed—$2\frac{1}{4}$ miles per hour—the manufacturers claim that it exerts a draw-bar pull of 1,800 lbs., and in low gear of 2,500 lbs.

SALISBURY TRIALS.—These were carried out on the municipal farm lands situated near Hartmann Hill.

Trial No. 1.—The first demonstration on 6th June was made on

a comparatively level stretch of red diorite soil, which had been cropped under mealies in the previous season. The land had previously been fairly well cleaned of stalks. Drawing an "Oliver" double-furrow mouldboard plough giving a cut of 24 inches and a depth of 10 inches, the average speed was $2\frac{3}{4}$ miles per hour, or a ploughing rate of $\frac{3}{4}$ acre per hour. The next test, on the same date and under similar conditions, was with a three-furrow disc plough, the cut in this case being 33 inches and the depth 8 inches. The average speed was $1\frac{1}{2}$ miles per hour, or a ploughing rate slightly exceeding $\frac{1}{2}$ acre per hour.

Trial No. 2.—This was carried out on 13th June in the same locality on fairly level red diorite virgin soil. Using again an "Oliver" double-furrow mouldboard plough having a cut of 24 inches and a furrow depth of $5\frac{1}{2}$ inches, the average ploughing speed was 2 miles per hour, equal to a ploughing rate of $\frac{1}{2}$ acre per hour. A further test made in land which had been previously cropped gave slightly better results, the depth of furrow being in this case 10 inches.

The "Oliver" plough used on both occasions is of special design to work with this type of tractor. It was connected close up to the tractor by a universal coupling, and could be operated by the driver from his seat, without any assistance from any other person.

The general impression from these trials was that, whether in hard new soil or previously ploughed lands, the tractor did its work with a two-furrow plough with ease. The ploughing was uniform and the furrows straight, while the slices were well turned and the depth of plough bottoms well maintained. The soil was well pulverised, and this was especially noticeable with the three-furrow disc plough. The acreages ploughed during each of the above demonstrations, for they can hardly be called trials, were small, and the results, although quite satisfactory, should not be looked upon as in any way conclusive as to what a tractor of this kind can or cannot do.

The tractor has a wheel base of 63 inches and a tread between wheels of 38 inches. It can turn in a circle of 21 feet, which is a very desirable feature in connection with orchard work. It is possible in this latter direction that the greater scope will be found at the moment for this class of machinery.

A further important feature is that with the higher ploughing rate more work can be done in one day than with probably two spans of oxen. Where the number of animals is limited, this will enable ploughing or cultivation to be got through quickly while the ground is still in the most favourable condition for these operations. This in itself is an important factor in orchard work, especially where irrigation is practised.

It should be noted that the engine is started on petrol, but runs wholly on paraffin as soon as it becomes heated up. No details are available of the fuel, lubricating oil or water consumption on the above trials. The running costs being the determining factor in the feasibility or otherwise of using this class of machinery, the following extract from a report by the Principal, Elsenberg College, Capetown, of trials of several types of tractors, will be of interest:—

"Fordson" Tractor Trials, Salisbury; 2-furrow Oliver mouldboard plough on old land.

"Fordson" Tractor Trials, Salisbury; 3-furrow disc plough on old land.

Fuel Consumption and Ploughing Rates of "Fordson" Tractors at Elsenberg Trials.

Class of Soil.	Quantities per Acre and Ploughing Rates.					
	Paraffin Oil.	Petrol.	Lubricating Oil.	Water.	Acres per Hour.	Depth of Ploughing.
	Galls.	Pints.	Pints.	Galls.		
Virgin vlei land ...	3	0·28	2·48	4·71	0·70	8 inches
Hillside land of coarse sandy loam	2·25	0·20	0·96	2·31	0·80	6 inches

On the basis of Capetown prices, with paraffin oil at 2s. 1d. per gallon, petrol 3s. 10d. per gallon, lubricating oil 5s. 9d. per gallon, and the wages of a white driver at 10s. per day, the running costs in the above trials were as follows:—

Cost per Acre.

Class of Soil.	Fuel, etc.	Labour.	Total.
	s. d.	s. d.	s. d.
Vlei land ...	8 2	2 2	10 4
Hillside land ...	5 6	1 8	7 2

Bacon Curing on the Farm.

Through an error in printing, the illustration appearing in the last issue of the *Journal* shewing two sides of bacon was reversed, and wrongly described Fig. 1 as Large Black and Fig. 2 as Berkshire. Fig. 2 is the Large Black side and Fig. 1 the Berkshire.

The Flower Garden in Spring.

By N. L. Kaye-Eddie.

There are very few people who do not desire to have a nice garden, and to obtain this it is most essential in the first instance to attend to the preparation of the ground. The smaller the ground, the greater should be the care bestowed upon it, if a fine display is to be obtained.

The soil should be dug as deeply as possible or trenched, broken up thoroughly, manured if feasible, and again turned over. A dressing of wood or grass ash is of great benefit, especially to heavy soils. It is also advisable to soak the beds a few days before planting either the seeds or plants.

In gardens where a lot of space is available, long narrow beds will be found the most advantageous, they being easy to cultivate, water and attend to generally.

The pruning of roses should be completed by the end of July, and all dead wood and faded flower stems removed from perennials. A word of warning is necessary in regard to roses, especially the tea varieties. Do not be too severe in the pruning of these, and do not let the shape of the bush be the entire aim. Strong vigorous wood should be retained, and old hard wood, wanting in eyes, should be cut away. Roses and shrubs should be transplanted before the spring. These will grow in almost any soil, especially roses, and if the ground is not trenched, they should be planted in good large holes. These should be 2 to 3 feet wide and deep—the larger the better—and square holes, square at the bottom, are preferable, as the roots are not so apt to be turned or confined therein. In filling these holes, mix the soil with good manure, rotted if possible, and ash, watering well before the hole is quite filled in. The filling-in process should then be completed, and the earth tramped well down around the plant.

Seeds of every description, both annuals and perennials, may now be sown—the earlier the better—but it must be remembered that warmth and moisture are the biggest factors for seed germination, and both should be as regular as possible. Therefore seeds planted early, and those of delicate nature or of more difficult germination, are better grown under some protection, preferably glass or calico, and they should be pricked out as early as possible.

The writer has found that the best way to raise expensive and rare seeds, and those difficult to germinate or to transplant, is to sow them,

one to three seeds, in small pots made of heavy brown paper folded about 2 inches square, and to place these in a half paraffin tin, which holds about 25. These pots are filled with good soil having but little decaying material in it. When the seedlings are just large enough, the plants are placed in position without removing them from the pots, which naturally decay.

Hardy seeds may be planted in seed beds or where they are desired to bloom, and transplanted or thinned out as required. Do not be afraid to do the latter, as one good plant is always better than three poor ones.

The following perennials are hardy and of easy culture, and suitable for both cutting and show:—Delphinium, gerbera, penstemmon, perennial aster, chrysanthemum, coreopsis, violet, antirrhinum, hunnemania, carnation, etc. They all have good lives and do well anywhere, and are easily raised from seed in boxes or beds. The first seven enumerated do best if they are broken up and replanted every year. If possible, they should be divided as soon as the blooming ceases, but if the grower cannot manage to tend to them until the rains commence, the operation should be done as early as can be managed before the restart of their growth.

Antirrhinum, penstemmon, carnation and salvia may be raised from cuttings, for which purpose pure sand is the best medium for striking them. They should be transplanted immediately the roots appear, which can be ascertained by gently lifting the plant with a knife. If the plant is left too long in the sand, it will become weedy and poor.

Carnations do exceedingly well in Rhodesia, and few gardens should be without this lovely flower. The American tree, Riviera market, Chabaud, Californian giant and marguerite are splendid varieties, and all are of easy culture from seed or cuttings.

Seeds are best grown in boxes and pricked out into tins of 25 to 30 when the plant shows its second leaves, and it should be transplanted to the bed as soon as it is strong enough. Care should be taken that it is not allowed to get weedy in either stage.

In conclusion, the writer would like especially to draw attention to the following remarks:—Surface dressings of manure, ash, fertiliser, etc., at intervals are most beneficial. Frequent cultivation is necessary. Overcrowding should be avoided; therefore thin out accordingly. The earlier and the more frequent the flowers are picked, the more numerous and stronger are the blooms obtained. Do not be shy of gathering nice long stems for house decoration. Never allow plants to seed except for the purpose of gathering it.

Linseed.

By C. Mainwaring, Assistant Agriculturist.

Climatic conditions in most parts of the Territory are eminently suited to the production of an average crop of linseed, so that provided a farmer has suitable soil, sows the right kind of seed and pays attention to certain details as regards rotation, manuring and cultivation, there is no reason why he should not find it profitable to put down a moderate area under linseed each year, partly to supply his own needs and partly to dispose of the surplus to the oil and cake mills or to owners of high-class breeding stock.

Commercial linseed is obtained from two distinct types of the cultivated plant—*Linum usitatissimum*. A good deal of misunderstanding appears to exist regarding the proper type to grow in order to obtain the heaviest and most valuable yield of linseed.

In certain parts of the northern hemisphere possessing a moist and temperate climate, notably Ireland, Belgium, Holland, Northern France, Northern Russia (Baltic Provinces) and Canada, the first type, under the name of flax, is largely cultivated for the valuable fibre contained in the stems, and not for the seed, which is considered of minor importance, unless required for sowing purposes, when it is allowed to reach full maturity. The characteristic habit of the flax plant does not lend itself to profitable oil-seed production, even when sown thinly to induce branching. For commercial oil-seed the second type, under the name of linseed, is the one generally grown. This exhibits a dwarf and profusely branching habit near the base, even when closely sown. Seldom exceeding 18 to 24 inches in height, it produces an abundance of large flowers, with correspondingly large seed-capsules, which open spontaneously. The seeds are also considerably larger, paler in colour and heavier than those of the preceding type. Generally speaking, semi-tropical and tropical climates are more favourable to the production of linseed, while moist, temperate climates are best suited to the production of flax.

The world's supplies of linseed are raised in the Argentine, Brazil, Chile, United States, India, Southern Russia, Italy, Balkans, Egypt and North Africa. Argentine or River Plate linseed has proved to be the best as regards yield of seed and high oil content. In selecting seed for sowing purposes, only that which is bright, plump, clean (free from weed seeds, etc.) and of high germinating power—at least 90 per cent.—should be used. The soils best suited to the culture of linseed are deep,

Linseed—Experiment Station, Salisbury.

moist, medium loams, well drained, clean and in a good state of fertility. Land well adapted to the cultivation of any cereal crop is eminently suitable. Linseed is undoubtedly an exhausting crop, and liable to produce a condition of soil-sickness if sown too often in rotation. The usual interval between two successive crops is seven years. If the soil is weedy, it is advisable to make linseed follow a hoed crop. Under ordinary conditions, however, if the soil is fairly rich, linseed should follow a grain crop of some kind.

Too much stress cannot be laid upon the preparation of the soil. The desirable conditions are those which favour rapid and uniform germination and growth. The necessity for this is because the crop is a shallow rooted and quickly maturing one, its whole period of occupation of the land being only ten to twelve weeks. It is desirable, therefore, for the plant food in the soil to be readily available, and conditions such that all the plants will be of uniform height and ripen simultaneously. This can be obtained by ploughing to a depth of 7 or 8 inches in the autumn or early winter, followed by suitable cultivation and rolling in the spring, to produce a fine tilth and compact seed bed. Linseed is essentially a phosphatic and potash crop. It is not advisable to apply fresh farmyard, kraal or nitrogenous manures direct to the crop, as these are liable to cause luxuriant growth with a tendency to "lodging" and a diminution in the amount of seed produced. The plant is not damaged very materially by a light frost, but to be on the safe side it is advisable to postpone sowing until all chances of late frosts are over. At the same time it must not be forgotten that linseed suffers readily from drought, especially in the early stages, and the resulting crop may be stunted in growth and the seeds not fully developed. The latter end of November or the beginning of December may be regarded as the most suitable time for sowing. By sowing in drills 8 to 12 inches apart, there is not only an economy effected in the amount of seed used, but the seeds lie at a uniform depth (three-quarters of an inch below the surface) and are more easily sown than if broadcasted; moreover, the cleaning of the crop by scuffling or hand-hoeing is facilitated. This is important, because the root system of the plant being somewhat shallow, the proximity of any weed reduces the supplies of available plant food and retards the even development and ripening of the seeds. The rate of seeding per acre depends upon the variety of seed, its germination, capacity and the distance between the drills, but 25 to 30 lbs. per acre should be sufficient. After sowing, a light rolling is all that is necessary.

The proper time to harvest linseed is when the majority of the stems have turned yellow and the lower leaves have all fallen. The seed ripens in the shock, hence it is not necessary nor is it advisable to wait until the seeds are dead ripe before cutting. The sheaves should be fastened together in small bundles to hasten drying, and "shocked" or "stooked" in the same manner as a cereal crop. The thrashing may be done by beating the straw spread out upon a clean floor or bucksail, with sticks, the seed subsequently being passed through a winnowing machine to remove the chaff, etc.

Pont l'Eveque Cheese.

By Jas. B. Fisher, N.D.D.

Take sweet milk regulated to a temperature of 86—90 degrees F., and add rennet at the rate of 1 dram to every 3 gallons of milk, 1 dram being equal to 60 drops. Cover over the bucket containing the milk until coagulation or thickening takes place; this usually takes about one hour. The degree of firmness can only be gauged by actual experience. The usual test is to insert the forefinger into the curd at a slight angle and gently raise the point of the finger, when the curd should break over the finger with a clean fracture, leaving no curd sticking to it. The rennet should be mixed with cold clean water before adding, and has to be well stirred in for five minutes. When the curd is sufficiently firm it is cut into squares 1½—2 inches in diameter, and these are again cut across into the form of an angle to facilitate even drainage during draining.

Drainage.—In about three minutes, as soon as the whey has separated a little, ladle the curd into coarse straining cloths laid over wooden frames with latticed bottoms, through which the whey may escape. Do not put more curd into one cloth than that produced from 1½—2 gallons milk. Fold over loosely the two opposite corners of the cloth, and cover with another cloth to keep up the temperature, and leave for 10 to 15 minutes. After this time has elapsed, tie up plum-pudding fashion, which is done by taking up three corners of the cloth, and using the fourth corner to bind round them. By a process of very gradually tightening the cloth, which should be done every 10 to 15 minutes, the curd will have drained sufficiently and be firm enough for moulding in about two hours. Moulding should not be done before the curd has drained sufficiently, and here again only actual experience can judge this stage. Drainage may be hastened by opening out the cloth, and cutting the curd across in the form of a cross. On the other hand, curd must not drain too much, or it will not unite properly when placed in the moulds.

Moulding.—The curd should be broken up with the fingers, and filled into moulds placed on straw mats, with a board underneath each. Moulds should be 5—6 inches square. In filling the moulds, care should be taken that the softer portion of the curd is placed at the top, bottom and round the sides of the moulds, the firmer curd being placed in the centre; by doing so drainage is assisted, and a smooth-surfaced cheese is produced. Sprinkle in all about ¼ ounce of salt on the curd when filling into the mould.

Turning the Cheese.—When the cheese has stood for a few minutes, place a straw mat and board on the top of the mould, and reverse the cheese. If the curd projects above the top of the mould, do not squeeze the two boards tightly in turning. In about ten minutes turn the cheese over again in the same manner as described above, only the straw mat is arranged so that the cheese receives the impression of the straws in the opposite direction. As a result of altering the position of the mat at each turning, a cross-barred appearance is produced on both sides of the cheese. Each cheese should be turned five times on the first day. The following morning the outer surface of the cheese is rubbed with salt, ½ ounce to each cheese; the mould is removed for this operation, and it is replaced after the salt has been rubbed in gently.

Turn twice daily, and when the cheeses are firm enough to retain their shape without the support of the moulds, remove the moulds altogether; if necessary, the sides and other parts should be lightly scraped with a knife, to fill up any holes or crevices which might harbour cheese flies, mites or green mould.

Moulds should be ready to come off altogether on the fourth or fifth day. Keep the cheeses for three to four days, after the moulds have been removed, in a dry, airy room at a temperature of about 62—65 degrees F., or until white mould begins to appear, and then remove to the ripening room. The ideal temperature is 62—65 degrees F., but ripening rooms in this country register far above that; therefore keep as cool as possible. In the ripening room they are placed on straw and turned daily until ready for use—this will take about three weeks, when the cheese should be soft and springy to the touch. Cheeses which are greasy or liquefied on the surface result from the use of too low temperatures and want of sufficient drying prior to ripening. Those which are leathery in consistency, and not mellow, are the result of too rapid drainage of the curd. It is a good plan when ripening to place the cheeses close together on their sides, as this minimises the loss in weight produced by evaporation. The ripe cheese generally weighs 12—14 ounces. It lends itself readily to packing, and may be sold either in chip or card boxes or merely done up in tinfoil.

Gervais Cheese.

By Jas. B. Fisher, N.D.D.

This cheese is similar to renneted cream cheese, but it contains more acid. It is manufactured from fresh whole milk, which is enriched by the addition of one-half of its volume of cream.

Thoroughly mix the milk and cream together by continuous stirring for about ten minutes; regulate to a temperature of 60—65 degs. F. and add ½ c.c. rennet diluted with a little cold water. Cover the receptacle with a thick cloth, and stand it on a wooden surface, and away from any possibility of draughts, so that the temperature is not greatly reduced.

If set at night, the curd will be ready for ladling out into cloths of a suitable degree of coarseness next morning. An ordinary huckaback towel answers the purpose. Tie up the cloths with string (plum-pudding fashion), and hang them up to drain, but, as in dealing with cream cheese, do not place them in a draught.

Open the cloths occasionally when the drainage slackens, scrape down the curd that has hardened on the cloth and mix it with the softer curd inside. The length of time taken in draining is regulated by the number of times the cloth is opened out and scraped down. When the curd is sufficiently firm turn it out into a bowl, and mix into it some finely ground salt. Line the moulds* with blotting or similarly absorptive paper, and then place them on a board on which a straw mat has been spread.

Carefully fill the moulds with the soft curd, pressing it in firmly with a knife. The mould may then be removed, leaving the cheese on the mat, where it should remain until required for use.

To produce 12 Cheeses.

Quantity of milk, 2 quarts (3 bottles).
Quantity of cream, 1 quart (1½ bottles).
Quantity of rennet, ½ cubic centimetre (8 drops).
Temperature of setting (or renneting), 60—65° F.
Time of setting to ladling, 10—15 hours.
Draining period, 6—12 hours.
Quantity of salt, 1 teaspoonful.

*These are specially made for the purpose, and can be obtained from Messrs. Clarke Bros. & Brown, Ltd., Box 2215, Johannesburg, or Messrs. Henwood, Son, Soutter & Co., Box 74, Johannesburg.

Poultry Keeping in Rhodesia.

By ARTHUR LITTLE, Poultry Expert.

Incubation.—At the outset, it may be as well to state that those who have not the time to rear chicks properly, or those who are likely to do it in a half-hearted way, should not go in for it at all, but should content themselves with a few fowls of a good laying strain bought in their pullet year, to be kept for producing eggs for eating purposes only. The birds should be sold for killing just before their second moult and replaced by young pullets. Eggs carelessly incubated and chicks carelessly reared are never profitable, and should never be allowed to exist; but a little care given to both brings an ample reward in birds that are strong, healthy and vigorous, a pleasure to look at, and decidedly profitable.

There is nothing scientific about hatching and rearing; it is simply a matter of ordinary care and attention to details, combined with the exercise of common sense.

The Breeding Stock.—The first essential necessary to produce strong, healthy, profitable chicks is attention to the parents. Provided these are strong, healthy and vigorous, in good hard, lean condition, with no redundant fat (a fat bird will produce unfertile eggs, weak germs, and weakly chicks, difficult to rear to maturity), the eggs will hatch well, and the chicks come along with ordinary care, without any set-backs.

Select the Eggs for Hatching.—Use no eggs for incubation except those that are from birds that you know lay well, otherwise you are perpetuating a race of bad layers, no matter how much care and attention is given to them during their chickenhood and later as adult birds. Never set an egg that is small—these usually produce birds that will lay small eggs—nor one that is abnormally large. Select those that weigh from 2 oz. to 2½ oz., not too long nor too round, but of the true egg shape, with a good smooth, even shell. A misshapen egg, or one with a ridge round it, should never be set. The age, too, of the egg is an important point, for the fresher it is the better it will hatch. If it is quite fresh when put into the incubator or under the hen, the stronger will be the chick and the quicker it will come out after chipping. Most new-laid eggs will hatch on the twentieth day. To ensure good hatches, the eggs put into an incubator should not be more than a week old, and under a hen not more than ten days old.

Natural Incubation.—Having selected the right eggs, the question arises as to the use of a hen or incubator. Both have their advantages

and drawbacks. Provided other things are right, chicks hatched in an incubator are as strong (contrary to what many think) as those hatched under a hen.

Those who have only a few fowls should not go to the expense of an incubator, for it takes some time to collect sufficient eggs to fill it, and, as stated above, these must not be more than a week old, and once the incubator is filled, it is not available till the end of the hatch. Eggs should never be added during incubation; therefore, where possible, hens should be used. The difficulty is to have them broody at the right time—*i.e.*, early enough in the season—but if hatching is done from eggs laid early—*i.e.*, in March, April, May and June—these will produce early layers, and therefore early sitters the next season. Set the hen in a quiet, cool place. Dust both her and the nest well with insect powder. Use your own discretion as to the number of eggs to put under the hen; but, before doing so, put three or four china eggs under her, and, after she has settled down and has been sitting well for two days, gently take these away after dark, and slip the eggs to be hatched under her. See that she comes off once each day at the same time, and has a good feed of mealies, a little green food, clean water, hard sharp grit and some charcoal. Two days before the chicks are due to hatch, pour into the ground around the nest some hot water, and do this each day until all are hatched. Leave the chicks under the hen till it is noticed that she is becoming restless, and the chicks are coming out from under her. During this time the more rest and sleep they have, the better chance they have of starting life well. Then rub a little carbolised vaseline on the top of the head of each chick—this prevents the grey ticks, if there are any about, attaching themselves. These insects are frequently the cause of stunted, weakly chicks, and often prove fatal to them.

Artificial Incubation.—In choosing an incubator, remember that the tank or moisture machine under proper conditions will hatch well almost anywhere; the hot-air one will only do so in a moist atmosphere. Place it in a room or hut (a thick-walled pole and dagga one, with a thick thatch roof, cannot be improved upon in this country), where there is little or no vibration, where the air is of as even a temperature as possible, and is cool, sweet and fresh. After setting it up, test the capsule by putting it in a basin of warm water. If it swells up, it is all right; if not, it is defective and useless.

To bring the incubator, while regulating it, up to the correct temperature of 103 deg., stop up all the ventilation holes with linen; this will bring up the temperature much more quickly than if omitted. As soon as it is running at 103 deg. take out the linen, and run it for 24 hours without the eggs, to be sure it is doing so evenly. During this time the eggs can be put into the drying box to warm up, and in the morning they should be transferred to the drawer. It is better to do so at this time than in the evening, in case the temperature rises suddenly.

Some people recommend turning the eggs twice a day. In the writer's opinion once is sufficient, but where many mistakes are made

is in not cooling them sufficiently, especially towards the end of the hatch. A good test is to put one of the eggs on one's upper eyelid. If it still feels warm, the eggs have not been sufficiently cooled; but if it is just commencing to feel cold, the drawer can be replaced.

Testing the eggs during incubation is most important for several reasons. (1) It is only by testing that one knows whether there is too much evaporation, and so more moisture required or *vice versa*; the size of the air cell demonstrates this. (2) Whether some eggs are unfertile or otherwise; if left in, the temperature will be reduced and more difficult to keep even. (3) Whether addled eggs are present; if left, these, by giving off foul gases, are most detrimental to the chicks that are developing, which require as much sweet, pure air as possible to make them grow well and become strong and vigorous. All eggs should be tested on the evenings of the seventh, fourteenth and eighteenth days; further—this is most important—they should be turned for the last time on the eighteenth day, cooled for the last time on the nineteenth day, and the drawer shut and not opened again until the evening of the twenty-first day or the morning of the twenty-second. There is no doubt that the opening of the drawer to take out the chicks that are hatched—no matter how quickly performed—is the cause of many bad hatches and chicks dead in shell, for each time this is done the warm moist air rushes out, colder and probably drier air takes its place, with sudden evaporation, severe shock to the chicks hatching, drying up of the membranes, and a general set-back to the whole hatch.

When ready, take the chicks as quickly as possible out of the drawer and put them in the drying box; cover up the glass so as to keep them in the dark for the next 36 hours. They must be kept quiet and have as much sleep as possible. Do not disturb them under any consideration whatever, beyond seeing that they have sufficient fresh air, for if there is any sign of the glass becoming dim with moisture it is a sign that the chicks have not sufficient. In this case raise the glass gently, and slip a piece of cardboard underneath to allow more fresh air to penetrate. The reason that the chicks should be kept absolutely quiet for 36 hours is that a great deal of energy is expended by the chick in emerging from the shell, and unless this is renewed by rest and sleep, it starts in life under adverse conditions which can never be remedied.

The next stage is the rearing of chicks, both with a hen and in brooders, which will be dealt with in a future article. Suffice it to say here that the chicks must have *no food* for 36 to 48 hours after hatching, and then the first meal must be coarse sand or fine hard, sharp grit and small granulated wood charcoal.

The Shows.

BULAWAYO.

The twelfth annual show of the Bulawayo Agricultural Society took place on the 26th, 27th and 28th of May, before a very representative gathering of farmers and stockowners, and fully maintained the reputation for excellence which the society has achieved. A full and comprehensive report of the show appeared in the daily Press, and it is not necessary here to refer in detail to the various features which went to make up a very full programme. We take the opportunity, however, of offering our congratulations to the society for the conspicuous success which again attended their efforts this year, and to express the wish that the wide popularity which the Bulawayo show has attained will be still more enhanced in the future. There were possibly no great outstanding animals as in some former years, but from the point of view of breeding and preparation for show purposes, the general standard left little to be desired.

Cattle.—Shorthorns as usual were well represented. Amongst others, a very strong contingent came from the B.S.A. Company's ranch at Shangani, which secured the award in the group class against Mr. Drummond Forbes' representatives. The winner of the 1,000 guineas trophy, Mr. Woodforde's "Raithby Blenheim," which won for the second time, is a great example of the dual purpose animal, and has both Bates and Scotch blood in his veins. There was a general feeling that the Shorthorn as a purely beef animal for this country had somewhat lost favour, and it would seem that it is coming to be regarded as an animal more suited to the farmer than the rancher.

The Hereford breed was in great force, their number being considerably augmented by a selection of very nice young bulls sent up from the Union by Sir Abe Bailey. At the subsequent sale the figures realised varied from £100 to £200. It was pleasing to note that Rhodesian-bred bulls held pride of place when put to the test of purchase.

The Aberdeen Angus breed was represented by animals from both the Union and Rhodesia, some of which were especially excellent, as for instance Mr. T. Parr's bull "Hayston British Peer"—which was the runner-up for the trophy—and Mr. Leo Robinson's "Simple of Maismore," which was awarded a prize for the best beast (male or female) on the show. Bulls of this breed fetched from £50 to £300 each at the sale.

Devons were a little disappointing as regards bulls, though a nice lot of females were exhibited by various Rhodesian breeders. This class suffered somewhat by reason of the cattle regulations, which prevented exhibits being received from the Gwelo district.

Dairy cattle were better represented, both in quality and quantity than at any previous Bulawayo show, and this was largely due to the enterprise of the South African Friesland Breeders' Association in sending up from the Union an educative display of picked cattle. It was a female from this bunch that carried off the championship for the best Friesland female on the show. This fine animal, "Herbert's Hope Hettie," was bred by Mr. Henry Cloete, of Bedford, C.P., and at the sale following the show she was bought by Mr. E. Salter, Concession, as was "Colonies Plaats Auke," the winner in the class for heifers over one year and under two. All these cattle were eventually sold at prices varying from £130 to £250 for bulls, and £75 to £150 for heifers. The champion Friesland bull was Mr. H. Clarke's "Harlen's Boy Johannes." Mr. Clarke imported this fine animal from the Union lately, and great things may be expected from his progeny at future shows. Another outstanding animal was the runner-up, namely, "Blauwkrantz Gentleman," bred by Mr. W. H. Bartlett, of Queenstown. This animal was afterwards sold by public auction for £250 to Mr. R. le S. Fischer, of Headlands. This very fine constitutioned animal should put size and milking qualities into Mr. Fischer's existing Friesland herd.

The Ayrshire classes were not so well filled as they might have been, and only one outstanding bull was exhibited. This was the recently imported bull "Auchenbrain Annuity," imported from the Union by Mr. T. B. Hepburn, of Bulawayo. This is a great animal, shewing constitution and milking qualities.

Pigs.—The pig classes were well represented by Large Blacks and Berkshires, some really good specimens of the breeds being exhibited.

Dairy Produce.—In dairy produce the Cheddar and Gouda cheese entries were small, but the quality of the former was high, the first and second prize lots being of particularly high merit. The quality of the Gouda cheese and the butter classes were not so good as at the other local shows.

Poultry.—The number of entries (408) in this section constituted a record. Several of these entries (14) consisted of breeding pens of one cock and two hens, which brought up the total of birds exhibited to 436. The quality too all through was excellent, and a very great improvement on that seen at any previous Bulawayo show; in fact, the exhibits were quite as good as any show in the Union excepting the S.A. championship shows. There was hardly a poor bird staged, and very few medium ones. The utility White Leghorns, Black Leghorns, Rhode Island Reds and Indian Runner ducks were the outstanding features both in numbers and quality, the first mentioned taking premier place in this respect. As these are bred and judged solely according to points found in good layers, it promises well for the future egg production of the country. A number of birds exhibited—chiefly Rhode Island Reds, Games and Indian Runner ducks—were imported from the Union, but with these a big majority of Rhodesian-bred birds were able to hold their own. A pleasing feature of the show was the presence of birds exhibited by novices who had recently commenced poultry keeping, and many of these were eminently successful. The exhibit of eggs

was disappointing. As far as can be gathered, this was due to the price of eggs ruling at the time in Bulawayo, viz., 5s. 6d. per dozen, but exhibitors should be prepared to forego this for the sake of a good exhibit being staged and the chance of obtaining a reward.

Turkeys too were disappointing, there being only two entries in Toms and the same number in hens. The former were very good, but the two latter were small. There is quite an appreciable number of turkeys in the country, and among them a goodly number of excellent Toms; therefore many more entries of this bird should have been staged. Practically all the entries were from Bulawayo and district, only four coming from Salisbury (these obtained two special prizes, a first and a second) and a few from country districts.

The birds were judged on the day previous to the opening of the show, and all prize cards were up by the time the public were admitted at 9 a.m. on the first day. The officiating judges were Mr. Fergusson, of Pietermaritzburg, and Mr. A. Little, of the Department of Agriculture, the former judging the heavy breeds, Minorcas, Anconas and Black Leghorns, the latter the remainder of the light breeds, as well as ducks, turkeys and eggs.

The judging being concluded, candidates—of which there were three—for examination in seven different breeds for the S.A. Poultry Judges' Association certificate were examined by the two judges, and passed well in all.

During the show the poultry hall was always well filled with the public, and a keen interest shewn in the exhibits. Numerous queries were answered and advice and practical demonstrations very frequently given.

A lecture was given by Mr. A. Little at 10.30 a.m. on the second day of the show in the grand stand to an excellent audience, and numerous queries were answered afterwards.

The Government exhibit under the poultry section included models of trap nests, houses, brooders, water vessels, food hoppers, etc., all constructed from materials easily obtainable by poultry keepers and on farms; samples of grains, meals and green foods all grown in Rhodesia, the last-mentioned being of shrubs, bushes and plants cultivated in nearly every garden in the country; photographs of insects; fowls of high laying capacity; paintings of good, bad and indifferent eggs. A large number of eggs were also exhibited shewing the method of grading, and the weights and quality of first-, second- and third-grade eggs. Judging from the number of the public who examined this exhibit, the queries asked and the demonstrations required, great interest is being taken in poultry, and promises well for the future of this industry.

UMTALI.

The show at Umtali on 27th and 28th June attracted many visitors, and the general arrangements of the exhibits in the building and on the ground were very good. A marked improvement since last year was seen in the cool and convenient cattle sheds recently erected. The district has a reputation for high quality produce, and this was well maintained.

The mealies on show were not numerous as to entries, but the standard on the whole was high, and some of the exhibits could hold their own anywhere. The best bred single ear of 10-row Hickory King, put on by Mr. H. K. Kimpton, was considered by the judges to be a very good specimen and is probably equal to taking a championship when competing in the best company. It is hoped this cob will be sent to the Witwatersrand produce show. In addition to the ordinary farm produce seen at all Rhodesian shows, a bundle of wattle bark and a truss of sugar cane were noticed, both shewn by Mr. J. Meikle, entries which can hardly be expected in any other district. A very interesting feature was the junior sections for needlework, woodwork, drawing and special subjects. Most creditable and promising work was shewn, and the policy of encouraging young people by giving prizes and certificates of merit at agricultural shows seems to be a very wise one, and must tend to stimulate concentration and to create interests likely to be valuable in later life. This is true of all kinds of work, and for farmers' children particularly any aptitude for mechanics, such as wood or metal work, or for nature study in any branch, should be fostered to the utmost.

Cattle.—The exhibition of cattle was on the whole fairly good, there being one or two really good bulls present. The championship was carried off by a North Devon bull, "Pickford Mastiff," shewn by The Farm Lands of Rhodesia. The dairy stock exhibits were not so good. In the dairy produce classes the outstanding feature was the quality of the butter, quantity and quality being both quite above the average.

Poultry.—The poultry entries were few and the quality fair, the reason probably being that poultry keepers in this district lack the knowledge requisite for discriminating between good and medium birds. In the three days after the show that Mr. Little was able to spend among the poultry keepers, he came across a number of excellent birds, in some cases belonging to those who had put inferior ones on the show, and in others to those who had made no entries. The majority of poultry keepers in the Umtali district are decidedly keen, and it is to be hoped that a club will be started there.

The poultry pens were situated in the open air, and this requires altering. The breeds represented were Leghorns, Minorcas, Rhode Island Reds, Wyandottes and Sussex, essentially the breeds for the farmer, the two former being purely laying breeds and the three latter dual purpose breeds. Turkeys were few in number, but good in quality.

The entries in egg classes were good and the quality fair, but more attention should be paid to grading. It is not the largest egg that is always the best, but the exhibit that scores is the one in which all the eggs are uniform in size, shape and colour, and are clean, fresh and with a good texture of shell.

Next year it is to be hoped that the number of entries will be greatly increased, and the quality in proportion.

Citrus Fruits.—The number of exhibits was greater than it has been for several years, and the quality of the fruit shewed an improved standard; in fact, some of it would have taken prizes at any show in

the Union. There were new exhibitors in most of the classes, which consequently created greater competition. The Premier Estate secured the majority of the first awards, but the exhibits sent in by individual growers were on the whole distinctly good, and it is gratifying to note that the fruit was comparativley free from scale and other blemishes. The class for boxes of oranges packed for export only brought forward one exhibit, but it is to be hoped that next year there will be some competition, as it is proposed to establish co-operative packing houses at certain centres. In both the Washington Navel and Valencia Late classes there was considerable difficulty in awarding the first prizes, the fruit being of such equal merit. Mediterranean Sweet and Jaffa oranges were both good classes. Oranges unnamed and seedling orange classes produced some remarkably good specimens. Some very fine lemons were shewn, but this was not the case with grape fruit. The naartjes exhibited were very fine, as is usually the case at this show.

Other classes of fruit were well represented, the pineapples being very good.

RUSAPE.

The Rusape show, held under the auspices of the Makoni District Agricultural and Horticultural Society, on the 4th July, was a pronounced success, and illustrative of the agricultural possibilities of this rising district.

Maize.—The number of entries in the maize classes was good, and the quality of some of the exhibits excellent. Most of these came from the Inyazura section of the district, but Mazoe was also represented in the exhibits of Messrs. Cole Kemsley and P. Shone. Salisbury White maize was disappointing. The ears of this variety were lacking in uniformity, shewing bad selection, while the grain was of little depth and poor in shape. The Hickory King maize was of better quality, and the winning exhibit in the 10-row class contained some excellent specimens of this variety. This exhibit, which was the outstanding feature of the maize class, was sent in by Mr. L. Lloyd, of Inyazura.

Tobacco.—The number of entries was small, but some leaf of good quality was shewn by Mr. H. Barnes Pope.

Wheat.—Competition in the wheat classes was keen and some splendid grain was shewn. First honours were secured by Messrs. C. H. Walker and R. le S. Fischer. The society is to be congratulated upon the excellent display of this valuable grain, and it is to be hoped that wheat will be more extensively grown in the Makoni district.

Cattle.—Pure-bred cattle were not so numerous as they should have been, although two outstanding animals were present. One was Mr. R. le S. Fischer's new importation, a Friesland bull, which carried off the championship honours, and the other was Mr. Harnden's Shorthorn bull. In the female class the championship fell to Mr. H. Barnes Pope's Lincoln Red. Perhaps the chief feature of the cattle section was the high quality of the grade and cross-bred stock.

In the dairy produce section the butter classes were excellent, and the standard was higher than at any of the other shows.

Poultry.—The poultry section at this show was not so well filled with entries as it should have been, considering the number of birds in the district and that practically all these had not long ago been graded and examined individually. Further, the number of entries (36) did not represent the number of birds staged, for cross entries were allowed. It is to be hoped this will not be repeated, for this practice has fallen into abeyance elsewhere in South Africa. The quality of the birds shewn was fair, but some cross-breds were entered in pure-bred classes, and these of course had no chance of obtaining any award.

The exhibit of eggs was good, and the number of entries exceeded those at Bulawayo or Umtali. In regard to quality, the remarks made of the exhibits at Umtali apply here, and exhibitors in future would do well to pay more attention to grading.

The Government poultry exhibit of appliances, foods, graded eggs, photos, etc., was the same as that shewn at Umtali and Bulawayo, and was of much interest to poultry keepers and the public generally.

Citrus Fruits.—Considering the small quantity of fruit grown in the Makoni district, the fruit exhibits were commendable. In selecting fruit for show purposes exhibitors should take particular care to see that each individual exhibit is as even in size as possible, for uneven size fruit detracts very considerably from the value of the exhibit. In the class for the best collection of citrus fruits, the display was very creditable, while the Washington Navels were of good quality.

The pineapples exhibited here and at Umtali demonstrated the fact that this fruit can be successfully grown in the country, and growers can be assured of a ready sale.

Napier Fodder in California.

We have particular pleasure in reproducing the following article by Dr. P. B. Kennedy, Forage Plant Investigator, University of California, from the *Pacific Rural Press* of 29th March, 1919.

American experience with our native fodder plant will be read with interest by Rhodesian farmers. We agree with the opinions expressed as to its value and note with satisfaction the appreciation it is receiving in foreign countries. In Rhodesia to-day we have 862 acres under this crop. We concur as to the desirability of early and repeated cutting rather than permitting the stalks to mature before

harvesting, but cannot help expressing amusement at the not unnatural misinterpretation of the native view of this plant as a "muti." The native idea is based on a superstitious belief that the plant acts as an example to other crops and shews them how they ought to grow, not that it has any fertilising properties.—Ed., *R.A.J.*

"Our acquaintance with elephant grass (or Napier fodder) dates back to 1912, after reading an excellent account of it in its wild state in Africa by Dr. O. Stapf, of the Royal Botanic Gardens of Kew, England. We immediately got into correspondence with the writer in an endeavour to procure seed. He was unable to supply any, and the parties to whom he referred us had none for distribution. Meanwhile the United States Department of Agriculture secured some plants in 1913 from South Africa. These were multiplied by cuttings and root divisions in sufficient quantities to permit of its distribution to their field stations for trial and later to various farmers and others cooperating with the Department.

"During this same period the grass had also been introduced into Australia from Africa and seed sent to the United States. It is very probable, however, that the packages of seed sent from Australia were from African-grown seed and simply re-distributed to the United States. We have now growing plants which were raised from seed originating in the Belgian Congo, from seed from Rhodesia and from Australia. We mention these facts because of the confusion that has arisen as to the origin of the California plants and the various claims made in regard to their introduction into the State. It is very probable that the first plants grown in the State were at the United States Department of Agriculture trial grounds at Chico.

"There are two distinct types of elephant grass, a fine-stemmed, narrow-leafed type, and one with coarse stems and broader leaves. The seed received from the Belgian Congo produced for us plants with fine stems and narrow leaves, while the seed from Rhodesia produced plants with coarse stems and broad leaves.

"SOMETHING OF ITS HISTORY.—As a wild plant this grass is recorded in the botanical literature of Africa at least as early as 1864, but only in comparatively recent years has its forage value been recognised. A missionary by the name of Menyharth collected plants in Rhodesia during the years 1890 to 1894 and placed a note in connection with his specimen of elephant grass that it was good fodder for cattle. This statement, however, was not published until 1905. It is recorded as being seen occasionally in a 'state of cultivation' by the natives as early as 1898. The natives used the tall mature canes for fences and partitions for their dwellings and the leaves as a 'muti' or 'mushonga,' which means something to make other crops grow, or as we would understand it, an organic fertiliser. This discovery of the natives is corroborated by Dr. Zeller, who from the results of his analysis considered the rotting grass as well as its ash a very valuable manure. Diestel in 1907 and Pilger in 1908 are authorities for the statement that it is one of the best African fodder grasses.

"The real credit for the introduction of the grass to commercial

agriculture must be given to E. G. Kenny, the Native Commissioner at Gutu, and Col. Napier of Springs, Bulawayo, who about 1908 called the attention of the Agricultural Department of Rhodesia to the great possibilities of the grass as a fodder plant. Col. Napier furnished the roots which the Department distributed to its co-operative experimenters in the season of 1909-10. For this reason it would seem singularly appropriate to name the grass Napire fodder after Col. Napier.

"ITS DISTRIBUTION AND HABITAT.—From Dr. Stapf's article previously mentioned we gather the information that the grass occurs wild over a very large territory, including more than the southern half of the African continent. It grows in greatest luxuriance along the rivers and marsh lands, where it attains a height of 23 feet. From these areas it frequently extends into the open places in the brush and forest where much drier conditions prevail. In such localities it grows about 6 feet high.

"As one would expect with any plant having such a wide distribution and growing under such a variety of conditions of soil and climate, both coastal and interior, numerous forms and varieties occur in a wild state. Many of these variations have been considered and described as new species, leading to much confusion and very many names in the literature.

"For the present and until a detailed study has been made of the grass in its native habitat, we will follow the eminent authority, Dr. Stapf, and call it *Pennisetum purpureum*, regarding all other botanical names as synonyms.

"THE PLANT DESCRIBED.—Napier fodder is a perennial grass growing from 6 to 20 feet high, with fibrous roots like corn or sorghum, from which arise at the crown numerous stools, the number depending upon the age of the plant. A single cutting or joint, rooting as readily as a geranium, may produce as many as 40, 60 or 80 stems from the crown in a single season. The leaves are abundant, smooth and tapering, reminding one of corn or sorghum, and from 20 to 30 inches long and 1 to 2 inches wide. The margin or edge of the leaf is more or less rough. This is the only feature of the grass that we have so far discovered that might be considered unfavourable, yet no injurious results are recorded.

"The flowers are borne at the ends of the long canes and consist of narrow bristly yellowish-white plumes or spikes 6 to 12 inches long. Up to the present writing the grass has not produced fertile seed in California, and reports from Africa indicate that it is a shy seeder even in its native country.

"A patch of Napier fodder has a very pleasing appearance in the middle of the hot summer, with its dense bright green leaves obscuring the ground and hiding from view a person standing in it at a distance of 6 feet.

"METHODS OF PROPAGATION.—Napier grass does not readily grow from seed. We have sown it out of doors in both spring and fall, as is customary with other new grasses under trial, without results. By

careful culture in a flat or box or in the greenhouse, plants may be raised from seed. Only under the most congenial soils and climate, such as exist in parts of Southern California during the summer months, would one be apt to succeed in raising plants from seed in the open fields. The tiny, delicate-looking plants grow very rapidly and in the course of a few weeks have as many as nine stools if supplied with warm soil and weather and plenty of moisture. When established the plants need very little attention, and will continue to grow rapidly in a soil that would be considered deficient in moisture for most plants.

"A second method of propagation is by cuttings or joints, which consist of the mature canes of the previous season's growth. These canes are cut into lengths of about 18 to 24 inches and placed in a furrow and covered with 3 or 4 inches of soil. Roots and leaf shoots soon develop from the nodes or joints. Owing to the tremendous growth made by these plants laterally in a single season, for permanent plantings the distance between the rows should be 6 feet with the plants 3 feet apart in the rows. In gardens or small areas 3 x 3 would permit of cultivation with a hand hoe only.

"If planted 3 x 6 feet, 2,420 joints or root divisions would be required to plant an acre, or double this number if planted 3 x 3 feet. The success of this method will depend largely upon the condition of the canes when planted. The buds, which will be found at the nodes or joints, should not have sprouted and allowed to wither, and the canes must not have been frozen. For this reason in most localities in California it will be necessary to protect the canes from freezing weather by burying them in moist but not wet soil. Care should be taken to protect the pit from soaking rains and causing the canes to rot. One must always keep in mind that Napier grass is a warm weather plant, and that the time for planting is the same as for corn, sorghum or Sudan grass. It differs from these, however, in that it may be planted any time during the summer and fall if moisture is available. Too early spring planting or too late plantings are not recommended.

"A third and by far the most satisfactory method is by division of the roots. A mature clump of the previous season may be divided into 30 or more pieces, each one being considered a plant and transplanted at the same distance as the joints above mentioned

"A fourth method, which requires more skill and attention, is by the offshoots as they appear from the crown in summer. These break off readily at the base and include a solid portion which when placed in the soil under good moisture conditions will immediately root and produce new plants. C. W. Piper, of the United States Department of Agriculture, is authority for the statement that one South African farmer produced over 7,000 plants from three plants in a single year by using slips and root divisions. ' Similar instances are known in Southern California, where they have a very long growing season, although no actual counts have been made.

"Growth and Production.—No forage plant that we know of, including alfalfa, corn, sorghum or Sudan grass, will grow as rapidly or produce such enormous yields of excellent forage as Napier fodder. Well-established plants raised from cuttings the previous season were

cut off to the level of the ground with a hoe (by mistake) on 22nd May, 1918. This was severe treatment, yet we saw this same planting on 18th July, a few days less than two months, and it was a dense, leafy thicket, averaging 7 feet in height. A person standing in the grass 6 feet distant was completely hidden from view.

"We endeavoured to make an estimate of what the yield per acre might be by weighing a small amount; and, allowing for three cuttings in a season, a conservative estimate would be 60 tons of green fodder per acre. A. E. Breakwell, Government Agrostologist for New South Wales, reports yields at the rate of 16 tons of green fodder per acre from a single cutting. The experiments were conducted at the Grafton experiment farm, and were young plants placed 6 feet apart. At the Wollingbar experiment farm he reports that it yielded at the rate of 25 tons per acre of green fodder, and that they were able to obtain a growth of 12 feet in four months from cuttings.

"The University of Florida informs me by letter that on some of their best muck lands in the southern part of the State, where the growing seasons are long, even 60 tons per acre may be exceeded.

"When left uncut throughout the season in parts of Southern California, we have seen it 17 to 21 feet high, but this is a useless waste from a hay or soiling standpoint, as the canes become too mature and somewhat woody, are much less palatable, and the sum total of forage greatly lessened. When cut at from 3 to 7 feet high, depending upon the locality, it will make soft, pliable and sweet-smelling hay. New growth starts up again at once from the base, and in two months, with good soil and under irrigation, another cutting may be obtained.

"One can readily judge from the above that the yield obtainable is entirely dependent upon the length of the growing season, the character of the soil and the moisture conditions. It seems to have a preference for sandy loams, but will grow on any type of soil.

"Then comes the problem of its alkali tolerance, a very important feature from a California standpoint. We have no information whatever on this subject, nor can we even make a guess. Get a little and try it out on alkali soils and we will be glad to get your report.

"Will it grow on lands not suitable to alfalfa on account of the high water table? It probably will, as it occurs wild in South Africa along watercourses and marshy depressions. As to whether it will grow in the water or under the water we cannot say.

"Winter Hardiness.—As to its winter hardiness, we are still without definite knowledge. Last winter in Los Angeles the grass was not even frosted, while this winter the leaves were all frozen and the young canes injured. The roots and the mature canes were quite hardy. In South Africa reports tell us that the roots withstood a temperature of approximately 10 degrees F.

"Roland McKee, Assistant Agrostologist of the United States Department of Agriculture, who has conducted investigations with the grass at Chico, states that 'it has lived through the winter (there) without protection—that is the roots. The tops kill back to the crowns.' The minimum winter temperatures at Chico are: 1913, 13 degrees F.,

1914, 26 degrees F.; 1915, 22 degrees F.; 1916, 18 degrees F.; 1917, 18 degrees F.; 1918, 25 degrees F.; January, 1919, 19 degrees F.

"At Berkeley we have had unusual continuous cold weather this winter, yet the roots are not injured, although the greater part of the top growth is frozen.

"The indications are that well established roots will withstand the winters in such localities as the Santa Clara Valley south to Santa Barbara, Los Angeles, San Diego and Imperial, and the milder regions of the Sacramento and San Joaquin valleys. In South Africa it is reported as surviving at an elevation of 5,000 feet, but this is no criterion for us to judge by in California. The very late spring and early fall freezes in our mountains at high elevations would greatly lessen the growing season, and in most localities the winter temperatures are very low. This factor of climatic limitations can only be determined by experiments covering a period of years.

"FEEDING VALUE.—The test of the pudding is in the eating, and so it will be with Napier fodder. The supply has been so limited up to the present time in the United States that no extensive feeding tests have been made. Everyone has been anxious to let the canes grow for increase purposes as rapidly as possible.

"We have, however, many communications from farmers in California who have fed it in a small way to horses, cattle, sheep, goats, swine, rabbits, and even chickens. They are all enthusiastic about its palatability. Some even go so far as to say that cattle will pick it out of alfalfa when the two fodders have been purposely mixed and fed as hay. One party made it into silage in a barrel, and when opening it during the winter found it sweet and good. He says, 'The hogs devoured it ravenously.'

"The following analyses taken from the literature will indicate its comparative feeding value, as indicated by percentages of contents named:—

Ingredients.	Napier Fodder.	Green Corn Fodder.	Corn Silage.	Timothy.	Alfalfa.
Water	60·99	79·3	79·1	61·6	71·8
Ether Extract (Fats)	·55	·5	·8	1·2	1·0
Protein	3·20	1·8	1·7	3·1	4·8
Carbohydrates ...	17·52	12·2	11·0	20·2	12·3
Fibre	14·55	5·0	6·0	11·8	7·4
Ash	3·10	1·2	1·4	2·1	2·7
No. of Analyses ...	3	126	99	56	23

"The analyses of Napier fodder are somewhat unsatisfactory, as the material for one was a partially dried mature stalk and another from material that had not been cut since planting and probably too coarse. The large amount of fibre as compared with other fodder is apparent. Material selected for analyses at the optimum condition for hay would, we feel sure, very much reduce the per cent. of fibre. The amount of protein is as good if not better than most grasses, although not equal to alfalfa.

"Two of the analyses of Napier fodder are by Blackshaw in Rhodesia and one by Guthrie in New South Wales. The figures represent an average of the three analyses. The moisture contents were 55.33 per cent., 61.81 per cent. and 65.84 per cent. respectively. The analyses of the other fodders are taken from 'The Feeding of Animals,' by Jordan."

The Agricultural Outlook.

The season so far has been favourable, and there has been no unduly cold weather to affect the condition of stock, which generally appear to be wintering well. The ensuing period before the rains commence is, of course, the most trying time of the year, and those farmers who have made provision for it by the storage of ensilage will reap the benefit of their foresight. Water in some parts of the Territory is getting scarce, and early rains are hoped for. Grass fires are still more frequent than they should be, and considerable damage has been caused in certain districts. In this connection, we would commend to the notice of farmers' associations the excellent system initiated by the Figtree Farmers' Association, a description of which appeared in the last issue of this *Journal*. As regards disease, African Coast fever and quarter-evil are still in evidence, but no fresh outbreaks of the former disease are recorded, and it is to be hoped that we shall hear no more of these sporadic cases which are attended with such regrettable results. In regard to quarter-evil, this disease is causing some anxiety, but good results are hoped for from the new vaccine which is being procured.

There is still a fairly consistent demand for slaughter stock, and prices are good. The Canning Factory at Odzi will shortly be starting operations, and this should fill a long-felt want. The benefits of co-operation are being more and more realised in the Territory, and the practical application of the principle is evidenced by the erection of

this factory and by certain projected schemes in other parts of the country intended to develop the maize trade and the dairy industry.

There are very few crops to report upon at this time of the year, but winter wheat is doing well in the Victoria district, where it is grown in moist vlei ground. It is yet too early to give final figures of the maize crop, but latest estimates put the total yield at something over 900,000 bags. This is not a record, but it is possible that when the final results are known last season's crop may yet top previous totals. The work of grading the maize prior to despatch to Beira for export is proceeding apace, and consignments are going forward as quickly as wharf accommodation at the port is available.

Tobacco is receiving a good deal of attention, and prospective growers are busy preparing seed beds. A certain amount of tobacco will be exported to the United Kingdom this year and advantage taken of the preferential tariff which comes into force on 1st September. Information as to the prices realised will be awaited with interest.

Citrus trees are generally faring well, and, providing the present condition of things is maintained, this Territory will in a few years be no inconsiderable factor in the fruit trade of Europe. The B.S.A. Company have exported a certain quantity of fruit from their estates this year, and we may later be able to furnish information as to the prices realised. The lack of shipping is at present restricting export, but this difficulty is expected to be overcome before next year's citrus crop is ready to be sent away.

Shorthorn Society of South Africa.

We have just received the 1918 *Annual* of the Shorthorn Society of South Africa, which maintains in every way the creditable standard set by previous productions. The booklet is well illustrated, and in the text will be found a comprehensive record of the doings of this famous breed in South Africa, while much information of an educative nature is also embodied. The membership of the Society at 22nd March, 1919, numbered over 300, and the Secretary (Mr. Cuthbert A. Pope, of Molteno, Cape Province) is confident of adding to this number during the ensuing year. All interested in the breed may be strongly recommended to join this strong and useful Society.

Correspondence.

ARSENICAL CONTENT OF DIPPING TANKS.

An enquiry was recently addressed to this *Journal* as to why dipping tanks lose in strength of arsenical content, even when they are carefully and methodically watched and tested and re-charged each week after dipping. This enquiry was submitted to the Agricultural Chemist, who replied as follows:—

"When there is a diminution in the percentage amount of *total* arsenic in a tank fluid, the loss in strength must be due to the entrance of rain or flood water. As long as no flood water enters the tank, and any loss of water by evaporation is made good, the percentage amount of *total* arsenic in the fluid remains unchanged.

"Reduction in the percentage amount of 'arsenious' arsenic, that is, arsenic present as arsenite, may take place owing to the oxidation of the arsenite to arsenate. Such oxidation is more common in tanks used at long intervals with a small number of stock."

How to Lay off an Acre or Less.

1. To get one acre measure:—

   Rod measures: 10 x 16; 8 x 20; 5 x 32; 4 x 40.

   Yard measures: 5 x 968; 10 x 484; 20 x 242; 40 x 121.

   Feet measures: 208.7 x 208.7; 220 x 198; 110 x 396; 60 x 726; 120 x 363; 300 x 145; 400 x 108.9.

2. To get less than an acre:—

   To measure off—

   $\frac{1}{2}$ acre it will take $147\frac{1}{2}$ feet each way,
   $\frac{1}{3}$ acre it will take $120\frac{1}{2}$ feet each way,
   $\frac{1}{4}$ acre it will take $104\frac{3}{8}$ feet each way,
   $\frac{1}{8}$ acre it will take $73\frac{3}{4}$ feet each way.

(*The Farm*, Adelaide.)

Veterinary Report.

May, 1919.

AFRICAN COAST FEVER.

Melsetter District.—A fresh centre of infection was discovered on the farm Sawerombi; one animal affected.

Gwelo District.—A serious outbreak occurred on the farm Clearwater, Hunter's Road, and to the end of month 212 cases had occurred. Subsequently the disease was found on the adjoining farm Northfield, under the same management, three animals being affected.

Mazoe District.—A few days previous to the discovery of Coast Fever at Clearwater, Gwelo district, 62 oxen had been forwarded from there by rail to the farm Avonduur, Mazoe district. Fortunately the cattle were loaded up at Hunter's Road station, which is on Clearwater, and off-loaded at Wolf Hill siding, which is on Avonduur. Some of the oxen remained in Avonduur, the balance going to the adjoining farm Leopards' Vlei. On inspection three days after the discovery of Coast Fever at Hunter's Road, it was found that at least 50 out of the 62 were diseased, and it was decided to destroy all of them. This was immediately carried out.

QUARTER-EVIL.

A number of fresh outbreaks occurred in the Midlands, one on the northern border of Charter district, one in Marandellas district and three in Salisbury district. The manner in which this disease is spreading in the form of a mild epizootic in a northerly direction is most extraordinary, and it is to be noted that adult cattle are not infrequently attacked.

ANTHRAX.

One case occurred on the Macheke-Mtoko road, in the Makoni district.

IMPORTATIONS.

From Union of South Africa:—Horses, 135; mules, 71; donkeys, 6; bulls, 49; heifers, 18; sheep and goats, 2,543. From the United Kingdom:—Bulls, 8; heifers, 6.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo, 704; *via* Liebig's Drift, 233; sheep and goats, 25. To Tati Concession:—Mules, 2. To Belgian Congo and Northern Rhodesia:—Horses, 6; mules, 12; pigs, 6; donkeys, 12. To Portuguese East Africa:—Slaughter cattle, 25; farm oxen, 34; mules, 3.

June, 1919.

AFRICAN COAST FEVER.

GWELO DISTRICT.—No fresh outbreaks. At the infected farms Clearwater and Northfield 81 head died or were destroyed as diseased.

MAZOE DISTRICT.—Sufficient time has not yet elapsed to determine what infection was disseminated by the infected cattle brought from Hunter's Road last month.

QUARTER-EVIL.

Fresh outbreaks reported from the Chibi, Charter, Salisbury and Lomagundi districts.

ANTHRAX.

One ox died on the Macheke-Mtoko road from this disease.

CONTAGIOUS ABORTION.

Fresh centres of infection were discovered in the Makoni and Salisbury districts. There is no doubt that the disease is widespread throughout the Territory.

TUBERCULOSIS.

At the Johannesburg municipal abattoirs three oxen exported from Matabeleland were found to be affected with tuberculosis.

TRYPANOSOMIASIS.

Ten head of cattle died on two farms on the Portuguese boundary, in Melsetter district.

WILD CARNIVORA.

In Melsetter district 30 head of cattle were killed by lions. From casual reports it appears that wild dogs are causing a considerable loss of stock in several districts.

IMPORTATIONS.

From the Union of South Africa:—Bulls, 138; heifers, 21; horses, 209; mules, 21; donkeys, 38; sheep and goats, 3,286. From the United Kingdom:—Bulls, 26; heifers, 34.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle *via* Bulawayo and Plumtree, 1,410; *via* Liebig's Drift, 914; breeding stock—cows, 5; bulls, 2; horses, 3; sheep and goats, 198. To Northern Rhodesia and Belgian Congo:—Horse, 1; donkeys, 20; sheep and goats, 190; pigs, 4. To Portuguese East Africa:—Bulls, 10; cows, 45; calves, 14; horses, 4; mule, 1; slaughter cattle, 26. To Northern Rhodesia *via* Inyanga and Portuguese East Africa:—300 oxen for farm work.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

August.

BEE KEEPING.

Now that warmer weather prevails, hives can be opened with safety and examined. Do this when the sun is shining and without exposing the bees too long. The queens are now laying, and, should there be a scarcity of food, feed the bees with syrup inside the hive. Where a hive carries a fair supply of honey, queens can also be encouraged to produce eggs by crushing with a knife blade the cappings of sealed honey still remaining in brood combs. This month and next bees will be collecting nectar and pollen from fruit and bush bloom. Where strong south-easterly winds prevail, hive entrances should be shielded. This will afford bees great assistance in their going out and coming in.

CITRUS FRUITS.

Orange trees should already have been pruned, and should now be ready for the first irrigation. The first growth should be commencing early in the month, and by this time the trees should already have had one good soaking. As soon as the trees have set their fruit they should never be allowed to stop growing through lack of moisture, otherwise the fruit is liable to be poor in quantity and lacking in quality. After irrigation, cultivation should follow, and the earth round the trees be loosened with a spade. If fertiliser is to be used, it should be applied after the first irrigation, so as to be thoroughly incorporated with the soil in the cultivation following.

CROPS.

Provided there are no heavy frosts, dhal may be allowed to remain until August before harvesting. As a second or third year crop, dhal can always be cut earlier, say towards the end of June or in July. Castor beans should be harvested as the pods ripen, which they continue to do for a considerable period. Ploughing should be undertaken continuously wherever possible; the value of early ploughing cannot be over-estimated. Ploughing should be followed as soon as possible by harrowing. Mangels can be pulled and fed as required. The ensilage pit can now be opened, and the contents fed. Seed potatoes should be worked over, and decayed tubers removed.

Crops under irrigation will require but little attention. In oat crops, where the seed has been obtained from the Union, care should be taken to weed out any Drabak or Darnel (*Lolium temulentum*) that may be growing among the crop, as this weed is poisonous. Care should also be taken not to over-irrigate any of the lands.

ENTOMOLOGICAL.

Potato.—Early planted crops of potatoes may be attacked by caterpillars. The crops should be sprayed immediately with an arsenical wash.

Cabbage Family.—Young plants of this family should be kept sprayed with an arsenical wash to check attack by webworm. Do not spray plants of which the foliage is to be eaten within three weeks of use.

Onion.—May still be troubled with thrip. Use tobacco wash or paraffin emulsion.

Deciduous Fruits.—Any trees infested with scale may be sprayed with a winter wash during August. Lime sulphur salt wash or scaleside is recommended.

Guava.—Collect and destroy remnants of late crops to keep down citrus codling, especially if trees are in vicinity of citrus orchards.

FLOWER GARDEN.

This is a busy month, and the soil should be kept in good tilth. Roses, shrubs and ornamental trees may be planted. All seeds may now be sown. Marguerite carnations sown now will flower by the end of the year. Cuttings of carnations and other perennials should be planted either in the open ground or in boxes, using loose and well-decomposed soil for the latter, taking care that they are well drained, or the success will be small.

FORESTRY.

Cuttings of ornamental shrubs, roses, etc., struck in sand last month should be transplanted into good soil as soon as they shew a good healthy growth of leaves. A large percentage of cuttings will damp off if left in sand longer than about six weeks. No manure should be added to the potting soil. Seed beds should be prepared and all conifer seeds sown. Gum seeds may also be sown if required for planting early in the season. If the trees are to be grown in seed beds only and not in tins, then gum seeds should not be sown until October, or later, as they will get too large.

GENERAL.

Fireguards should be completed and every precaution taken to guard against loss of grazing from fires. Natives commence ploughing their softer land this month, and for this reason, as well as because beer is plentiful at the kraals, local labour is apt to be scarce. At this time of the year, however, the need for boys on farms is not so severely felt as later on.

POULTRY.

By the end of this month all those who are not able to give very much attention to the chicks while in the growing stage should have stopped hatching. Those who can give some extra care to make war on insects should keep the chicks in the shade, and watch them carefully. They can continue hatching for another month, but not later, for if they do, the result will be slow growth and weediness in the young stock, deferred maturity and fewer eggs later. Now that the hot weather is approaching, a constant war on insects must be carried out, and of these sand fleas and fowl ticks (often erroneously called tampans) will be found the most troublesome. Fowl ticks were fully dealt with in the *Journal* for February, and a bulletin of this article can be obtained upon application to the editor.

Sand fleas, as most poultry keepers know, are found on the face, wattles, ear lobes and combs. Application of any grease will kill them, as they breathe through pores in the skin; if these are stopped up, the insect is suffocated. More than this is, however, necessary, for the breeding quarters of these insects (and they multiply very rapidly indeed) is in the dust of the floor of the house and that of the run. This should be treated every week in one of the following ways:—

(1) thorough soaking with a solution of a teacupful of Kerol or Jeyes' Fluid, etc., to a paraffin tin of water;
(2) a strong solution of salt and water;
(3) dusting over and raking into the soil a mixture of 1 part of flowers of sulphur and 2 parts of finely powdered lime.

Unless this treatment is carried out, constant trouble will be caused by these insects, which tend to stop the growth of chicks and young birds and lessen the output of eggs from the adult birds.

STOCK.

Cattle.—On the early granite and sand veld probably the worst of winter is over so far as grazing is concerned, and a nice bite of green grass is appearing. Care should be taken where cattle are allowed to graze on the early burnt grass not to let them get too much at first. On diorite farms the haystack will still be required, and in all cases a certain amount of hay or ensilage should be held in reserve against the possibility of very late rains. The bulls may again be put back into the herds. Any very young calves should be kept near home, and dipping should be carefully attended to. In dairy herds on any soil whatever, feeding, housing and bedding cannot be relaxed. Cows in full milk will benefit by a ration of, say, 5 lbs. of maize (crushed and soaked), 30 lbs. to 40 lbs. of ensilage or pumpkin and 8 or 10 lbs. of hay. If it is possible to give, in addition to the above daily ration, 2 lbs. of peanuts, crushed with the shell, or linseed ground with maize, or peanut cake, a very great benefit will be derived. Calves, especially young ones, must be carefully watched; they should not run too far, and are better inside, except when the weather is warm. It will pay to feed to them a little sweet hay, bean meal, linseed, peanuts or peanut cake and a small ration of green food.

Sheep.—Sheep should give little trouble at this time of the year, but on very dry veld a handful of mealies and a little hay or ensilage will materially assist ewes with young lambs.

VEGETABLE GARDEN.

All vegetable seeds may now be planted. Those having but a limited supply of water would be wise to sow in boxes, transplanting when large enough. The seed beds require careful preparation; they should be well raked up and laid out in long narrow rows in order to facilitate watering. The tops of the beds should be levelled as near as possible, and when sown, covered over with a thin layer of straw or grass, which will prevent the seeds being washed out when watering and the soil from caking.

VETERINARY.

Redwater and gallsickness occur all the year round, although these diseases are more prevalent during the summer months. A good many deaths occur this month, however, amongst imported stock. Vegetable poisoning will probably be in evidence. Sheep can be inoculated against blue tongue. Scab is a poverty winter disease.

WEATHER.

No rain is to be expected, and even on our eastern mountains the precipitation is trifling. Showers, however, do occasionally fall in places, but are of no consequence. The sun is often warm during the day, but the nights are apt to be cold, and grazing being scarce, food and shelter are necessary for the stock.

September.

BEE KEEPING.

In sheltered localities many trees in the bush will now be in bloom. Should there be indications of swarming, put on a crate of sections or shallow frames, correctly fitted with super-foundation. Where a swarm has been secured, place it in a modern hive, and from an established stock remove a frame of comb containing unsealed brood and honey, shake off the

adhering bees on to their own alighting board, then insert this comb into the centre of the newly hived swarm. This plan compels the bees to start work at once. As a means of preventing the escape of the queen, a narrow strip of excluder zinc may be fastened at the entrance. This should be removed after about two weeks.

CITRUS FRUITS.

If the trees were irrigated early in August, the next application of water should be given about the first or second week of this month. After irrigation, cultivation should follow. Constant attention should be given to young trees, and a watch kept for any adventitious shoots or suckers, which should be cut away at once. This should be attended to right through the growing season.

CROPS.—See August.

ENTOMOLOGICAL.

Tobacco.—Young plants in seed beds may suffer from cutworms. See Handbook of Tobacco Culture, published by Agricultural Department, pp. 71-90.

Potato.—Early potatoes are liable to suffer from caterpillars. The crop should be sprayed at first sign of injury with an arsenical wash.

Cabbage.—During this month the most prominent enemies of plants of this family are diamond back moth and webworm. Cabbage louse is sometimes troublesome. The young plants may be sprayed or dusted with an arsenical compound for the former, and sprayed with tobacco wash and soap for the latter.

Beans planted under irrigation during September usually escape serious infestation with stem maggot.

Citrus Trees.—Scale insects commence to increase rapidly with the advent of warmer weather, but the trees should not be sprayed or fumigated while in blossom.

FLOWER GARDEN.

Although our spring advances with this month, rains are very uncertain and usually scarce, but in spite of circumstances plants now grow with very little encouragement. Perennials and shrubs should be well attended to, especially those which flower early; the soil should be kept well stirred around the stems, and they should be watered if necessary.

Practically all flower seeds may now be sown in boxes, nursery beds, or in the open ground where they are to be grown. Nursery beds are perhaps preferable, as a great deal of watering may have to be resorted to on account of late rains. All annuals sown in July should now be ready for transplanting; should these be few, and a larger show of flowers desired, the heads may be pinched out after planting, which makes the plant spread out more and become bushy. Shrub and ornamental tree seeds should be sown now if desired for planting out during the rainy season, and may be sown in the open; if it is desired to hasten them they should be planted in boxes and covered with glass, and placed in a sunny position sheltered from the winds. If summer bulbs have not already been re-planted, this should be done at once; they sprout as the weather becomes warmer, and, if allowed to do this before planting, the bulb loses much of its vigour. It must be borne in mind that all bulbs that cluster, if divided, produce better blooms, and the plants have a better appearance than the old cluster, which has a lot of decayed matter and generally a ragged appearance; this also applies to those perennials which may be increased by division of roots.

FORESTRY.

All cuttings struck in sand in July and not yet transplanted into good soil should have this done as soon as possible. All gum seeds should be planted now if it is intended to grow the transplants in tins. If they are to be grown in beds only, don't plant gum seeds until next month. The seed beds may with advantage be prepared now and watered to make the weed seeds germinate, so that they may be destroyed before planting next month.

GENERAL.

Indigenous labour is apt to become more scarce at this time of the year, the boys returning to their kraals to break up the land for next season. Stock are liable to stray in search of the young grass now coming up, and much trouble from this cause is to be looked for on unfenced farms. Natives are now cultivating their gardens preparatory to sowing their crops, which they do much earlier than do Europeans. The mischief caused by veld burning becomes apparent from this time onwards in the condition of the stock, and it is necessary frequently to move them away in search of grazing.

POULTRY.

During the dry weather the supply of such green food as lettuces, cabbages, etc., becomes less, but there are many others which may take their place. For instance, the three following :—Bilhambra, plumbago and wild cockscomb, which are even better than lucerne. Other good green foods are Beira creeper, potato creeper, bougainvillea and Napier fodder. All green foods given to the birds—and they cannot possibly be given too much, for they greatly increase the egg production, and tend also to increase the size of the egg—should be chopped small and put in dishes or troughs. The method so often adopted of throwing it down whole to the birds cannot be too severely condemned ; it becomes dirty and withered, and much of it is therefore left by the fowls. Many of the young cockerels should be now fit for killing. Keep the best and get rid of the remainder, for to keep the poor ones means only so much waste of food and labour. They will never be profitable or fetch more than killing price. While on this subject of dispensing with unprofitable birds, it would be as well to mention that a large number of birds in the country have been individually examined and graded into three grades, viz., 1*st grade*, those which with proper treatment should lay over 180 eggs in the year. These the owner should keep for breeding from, or for selling privately at a remunerative price for the same purpose. 2*nd grade*, those laying from 100 to 180 per year ; not good enough to breed from, but profitable from the point of view of producing eggs for food. 3*rd grade*, those laying less than 100 eggs per year. These birds are *not* profitable, and are only fit for killing. All should be (many frequently are) killed at home, or sold either to private customers or on the market, but, needless to say, on this basis. It would be as well here to repeat (and evidently judging from observation it is necessary to constantly do so) that it is absolutely necessary to have a constant and unlimited supply of *hard sharp* grit, each piece being about the size of a wheat grain, before the birds ; also granulated wood charcoal of a similar size. Many poultry keepers do not recognise the fact that nature has not provided fowls with teeth in order to masticate their food, and unless they can do so, digestive troubles of all kinds are the result, followed by malnutrition, ill-health, no eggs and unprofitableness, and the unpleasant aspect of a miserable lot of creatures moping about. This hard sharp grit mixes with food in the gizzard, and, by a rotary movement caused by the strong muscles of this organ, grinds up or masticates the food. Oyster shell, or what is called shell grit, is neither hard enough nor sharp enough, and is only used to supply lime for the egg shells. Charcoal is given as a blood purifier and germicide ; as a general corrective it is invaluable for this purpose. Therefore, it is hopeless to attempt to keep fowls healthy and profitable without these two most important necessaries.

STOCK.

Cattle.—Ranching cattle should require little now in a normal season; it is only in the event of very late rains that trouble should be expected. Where possible, it will be wise to keep an eye on those cows that may be expected to calve early, with a view to feeding them if necessary, and seeing that they do not get too poor. The dairyman will carry on much as in August; he will, however, use his discretion (in accordance with the condition of his veld) as to the use of ensilage, pumpkins or other bulky and succulent food. He will be wise not to shorten the supply of concentrated foods for some time to come. A little hay or ensilage should still be kept in reserve until the rains have fallen in reasonable abundance.

Sheep.—The remarks for August apply. If spring lambs are expected, it will be wise to see that the sheep shed is in good order—clean, dry, properly drained and airy. Watch that the ewes shall not be poor when they lamb, and remember that they cannot rear good lambs if the veld is bad, but must have their grazing supplemented, just as milk cows are fed in order to produce milk.

TOBACCO.

Begin sowing seed beds each fortnight for the acreage proposed to be planted; fertilise and stimulate growth so as to be ready for planting out should rain come early in November.

VEGETABLE GARDEN.

Most seeds may now be sown, though there is risk of losses from want of rain. Watering, of course, can be resorted to. Marrows, pumpkin, melon, cucumber and peas may be planted in the field after the first rains. Tomatoes that have been sown earlier should be planted out, and these as they come on should be staked.

VETERINARY.

There should be very few deaths from redwater and gallsickness this month. Cases of vegetable poisoning of stock picking up tempting young green shoots of dangerous character on the burnt veld are of frequent occurrence. Sheep can be inoculated against blue tongue, but ewes in lamb should not be treated, on account of the danger of abortion. Scab may be prevalent.

WEATHER.

The temperature may be expected to rise steadily during this month. Rains are not due until next month, though the average over a period of years shews slightly more than in the previous four months, and ranges between .1 and .5 inch. Frost has been known to occur in September, although this is a very unusual event. Rain-gauges should be seen to before the rains commence. They should be carefully adjusted to stand exactly level with the lip four feet above ground, and care should be taken that no tree, building or other obstruction interferes with the fair precipitation of rain into the orifice.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1919	May	7·48	0·32	0·11	0·24
1919	June	5·48	0 24	0·13	0·18

TEMPERATURES.

Station	May		June	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	74·1	33·7	73·2	34·1
Hartley—				
Franceys Farm	78·4	43·1	—	—
Gatooma	80·1	47·3	79·9	43·8
Hartley Gaol	—	—	—	—
Lomagundi—				
Sinoia	82·3	64·3	78·7	64·4
Sipolilo	77·6	43·1	—	—
Mazoe—				
Mazoe Dam	71·9	32·0	69·7	36·5
Shamva Mine	76·4	47·6	74·4*	44·9*
Melsetter—				
Melsetter	66·6	46·0	66·1	47·1
Mount Selinda	70·6	49·1	69·2	50·0
Vermont	70·5	52·8	73·3	58·7
Salisbury—				
Botanical Experiment Station...	—	—	71·8	43·9
Chishawasha	74·4	45·7	74·0	43·9
Salisbury Gaol	73·3	42·3	72·8	39·5
Umtali—				
Public School	—	—	—	—
Victoria—				
Eythorne	67 7	42·5	67·1	40·5
Morgenster	—	—	—	—
Victoria	70·7	45·0	70·3	41·4

* For nine days only.

TEMPERATURES—*(Continued)*.

Station	May		June	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	71·6	44·6	72·5	40·8
Garth	72·1	47·3	72·9	43·6
Plumtree School	70·6	47·6	65·7	46·1
Retreat	81·9	50·2	82·6	60·7
Riverbank	75·5	46·2	75·4	42·9
Bulawayo—				
Observatory	70·3	45·5	70·9	44·0
Gwanda—				
Antelope Mine	74·2	53·5	73·2	52·7
Mazunga	81·5	46·9	80·8*	45·4*
Tuli	79·3	60·5	—	—
Gwelo—				
Gwelo Gaol	70·4	37·5	72·4	37·4
Matobo—				
Holly's Hope	75·1	42·3	—	—
Rhodes Matopo Park ...	72·3	43·7	72·6	40·5
Umzingwane—				
Essexvale	72·7	41·7	76·7	37·5
Hope Fountain	—	—	—	—
Wankie—				
Guyo	—	—	—	—
Victoria Falls	85·2	50·0	76·7	47·7
Wankie Hospital	83·1	53·4	82·4	48·8

RAINFALL.

Station	May	June	Total for 1918-19.
MASHONALAND—			
Charter—			
Buhera	0·26	—	32·23
Bushy Park	0·27	—	—
Enkeldoorn Gaol	0·06	...	26·06
Marshbrook	0·01	0·02	28·08
Range	0·04	0·17	30·83
Riversdale	—	—	—
Umniati	—	—	—
Vrede	0·15	—	—
Wylde Grove	—	—	—
Chibi—			
Chibi	1·02	—	—
Lundy River	—	0·16	16·77
M'Rumi	0·07	—	—
Nuanetsi Ranche	0·04	—	—

* For ten days only.

RAINFALL—*(Continued)*.

Station	May	June	Total for 1918-19.
MASHONALAND—(Continued)			
Chilimanzi—			
Central Estates	0·12	0·05	31·60
Chilimanzi	...	...	21·06
Driefontein	0·20	0 10	25·86
Felixburg (n.s.)	0·23	—	—
Induna Farm	0·22	...	33·16
Orton's Drift	—	—	—
Umvuma (Railway)	0·10	—	34·43
Darwin—			
Mount Darwin	0·10	...	35·98
Gutu—			
Chingombe	—	—	—
Eagle's Nest Ranche	0·47	—	—
Gokomere	0·77	0·33	25·62
Gutu	0·59	—	—
M'vimvi Ranche (n.s.) ...	0·78	—	—
Noeldale (n.s.)	0·45	...	21·99
Hartley—			
Ardgowan	...	—	—
Battlefields (Railway) ...	—	—	—
Beatrice (B.S.A.P.) (n.s.) ...	...	...	—
Cringleford (n.s.)	—	—	—
Elvington	0·03	...	34·41
Franceys Farm	0·34	—	—
Gadzema (Railway)	—	—	—
Gatooma	0·08	...	32·81
Gatooma (Railway)	...	...	30·61
Gowerlands	...	...	26·27
Hallingbury	...	...	34·28
Hartley Gaol	—	—	—
Hartley (Railway)	—	—	—
Hopewell	—	—	—
Makwiro (Railway)	—	—	40·36
Ranwick (n.s.)	...	...	—
Shagari (Chevy Chase) ...	—	—	—
Spitzkop	...	—	—
Inyanga—			
Inyanga	0·28	—	—
Inyanga Settlement	—	—	—
Rhodes Estate	0·30	—	—
St. Trias' Hill	...	—	39·16
York Farm	0·89	—	—
Lomagundi—			
Argyle	0·11	...	35·19
Banket Junction (Railway) ...	—	—	34·86
Darwendale	—	—	—
Duxbury Farm	...	...	29·42
Eldorado Mine	—	—	—
Eldorado (Railway)	0·26	—	—
Gambuli (Mukore)	0·40	—	—
Lone Cow Estate	...	—	—
Longmead	...	...	29 02
Maningwa	—	—	—
Mukwe River Ranche... ...	0·12	...	32·11

RAINFALL—(*Continued*).

Station	May	June	Total for 1918-19.
MASHONALAND—(Continued)			
Lomagundi—continued			
Palm Tree Farm	0·08	...	28·01
Sinoia	...	—	—
Sinoia (Railway)	0·29	...	26·59
Sipolilo	...	—	—
Umvukwe Ranche	...	...	31·89
Makoni—			
Carlow Farm	...	—	27·87
Chimbi Source	0·20	0·06	33·98
Craigendoran (n.s.)	0·25	0·53	—
Delta	0·10	0·18	38·20
Eagle's Nest Ranche	0·25	...	32·37
Forest Hill (n.s.)	0·31	0·13	—
Gorubi Springs	0·79	0·28	38·48
Headlands (Railway)	—	—	22·16
Mona	0·11	0·03	—
Monte Cassino Mission ...	0·14	0·07	54·01
Odzi (Railway)	—	—	43 57
Rusape	0·40	—	—
Rusape (Railway)	0·44	—	32·22
Springs	0·39	—	—
Marandellas—			
Bonongwe...	—	0·15	—
Huish Estate	0·09	0·11	33·52
Land Settlement Farm ...	—	—	—
Macheke (Railway)	—	—	37·80
Marandellas	0·32	—	—
Marandellas (Railway) ...	0·32	—	38·35
Nelson	0·06	0·04	32·46
Selous Nek	0·08	—	—
Theydon Farm	—	—	—
Tweedjan	...	...	29·00
Verdoy	—	—	—
Mazoe—			
Avonduur	...	—	—
Bindura	0·05	...	39·06
Bindura (Railway)	0·08	—	38·48
Ceres	0·17	—	—
Chipoli	0·03	...	40·09
Citrus Estate	...	...	34·05
Concession (Railway)	0·16	—	35·90
Craigengower	0·05	—	—
Dunmaglas	—	—	—
Glendale (Railway)	—	—	38·26
Kilmer	...	...	36·97
Kingston	0·19	...	36·10
Laguaha	...	—	—
Lowdale	—	—	—
Mazoe	...	...	38·53
Mazoe Dam (n.s.)	0·04	...	—
Mguta Valley	—	—	—
Omeath	...	—	32·54
Ruia	...	—	—
Ruoko Ranche	...	—	31·37

RAINFALL *(Continued).*

Station	May	June	Total for 1918-19.
MASHONALAND—(Continued)			
Mazoe—continued			
Shamva	0·05	...	48·01
,, Mine	0·03	...	40·68
Stanley Kop	...	...	35·04
Sunnyside	0·16	...	40·58
Teign	...	...	44·89
Virginia	...	—	—
Volynia Ranche	...	...	39·38
Melsetter—			
Brackenburg	2·39	2·03	46·07
Chikore	—	—	—
Chipinga	1·51	1·20	35·82
Helvetia	1·43	—	—
Melsetter	1·80	0·51	26·00
Mount Selinda	2·90	1·26	51·01
Mutambara Mission	0·58	—	—
Pasture	—	—	—
Tom's Hope	0·81	0·65	47·98
Vermont	3·42	2·14	54·99
Mrewa—			
Glen Somerset	0·05	—	—
Mrewa	—	—	—
Mtoko—			
Makaha	0·10	0·50	38·05
Mtoko	0·11	...	32·04
Ndanga—			
Bikita	4·48	2·88	53·05
Chiredzi Ranche	0·64	—	—
Marah Ranche	—	—	—
Ndanga	1·56	1·39	33·62
Salisbury—			
Ardbennie	0·10	...	32·05
Avondale	0·08	—	—
Borrowdale (Hatcliffe) ...	0·11	...	32·55
Botanical Experiment Station ...	—	...	—
Bromley	0·23	—	—
Brookmead	—	—	—
Chishawasha	0·17	...	36·85
Cleveland Reservoir ...	0·06	...	33·16
Ewanrigg	—	—	—
Forest Nursery	0·12	...	—
Glenara	...	...	37·14
Goromonzi	0·17	—	—
Gwebi	...	—	—
Hillside	0·09	...	33·00
Lilfordia	...	...	37·52
Meadows (The)	0·13	...	42·39
Salisbury (Gaol)	0·06	...	36·52
,, (Railway)	0·04	—	33·14
Sebastopol	0·10	...	33·38
Selby	—	—	—
Stapleford	...	1·20	52·08
Sunnyside	...	—	—
Vainona	0·06	—	—
Westridge	—	—	—

RAINFALL *(Continued).*

Station	May	June	Total for 1918-19.
MASHONALAND—(Continued)			
Umtali—			
Chiconga	—	—	—
Hoboken	—	—	—
Muromo Ranche	0·73	—	—
Odzani	0·85	0·77	44·48
Penhalonga	1·82	—	—
Premier Estate	0·50	0·31	33·20
Public School	—	—	—
Reservoir (n.s.)	0·42	—	—
Sarum	—	—	—
Stapleford (n.s.)	1·58	—	—
St. Augustine's Mission (n.s.) ...	1·13	0·84	—
Stralsrund	0·11	0·25	29·05
Umtali (Railway)	0·61	—	35·70
Utopia	0·39	0·05	27·95
Victoria—			
Brucehame	0·81	—	—
Clipsham	1·05	—	—
Empress Mine	—	—	—
Eythorne	0·63	0·36	26·00
Fort Victoria (Railway) ...	—	—	18·33
Jichidza Mission (n.s.) ...	2·21	1·68	—
Makorsi River Ranche ...	1·40	0·23	27·06
Morgenster Mission	—	—	—
Silver Oaks	0·76	0·22	18·78
Summerton (n.s.)	0·28	—	—
Victoria	0·87	0·22	17·87
MATABELELAND :			
Belingwe—			
Bickwell (n.s.)	0·43	0·06	—
Tamba	0·24	0·23	17·79
Wedza	0·91	0·26	22·11
Bubi—			
Bembesi (Railway	0·31	—	—
Imbesu Kraal	...	—	29·19
Inyati	...	...	32·93
Maxim Hill	—	—	—
Shangani Estates	...	—	—
Bulalima-Mangwe—			
Empandeni	0·12	...	33·12
Figtree (n.s.)	0·24	...	—
Garth	0·91	...	30·77
Holdstock	—	...	—
Maholi	0·09	—	—
Plumtree Public School ...	0·22	—	—
Retreat	0·02	...	22·67
Riverbank Farm	0·08	—	—
Solusi Mission	0·15	...	28·87
Tjankwa	0·25	—	—
Tjompanie	0·09	...	28·59
Bulawayo—			
Keendale	0·06	...	19·76
Khami	0·07	—	—

RAINFALL *(Continued).*

Station	May	June	Total for 1918-19.
MATABELELAND—(Continued)			
Bulawayo—continued			
Lower Rangemore	0·04	...	27·56
Observatory	0·01	—	25·23
Raylton (Railway)	...	—	—
Saw Mills (Railway)	...	—	25·07
Umgusa	...	...	23·55
Gwanda—			
Antelope Mine	0·22	—	26·22
Gwanda (Gaol)	0·34	0·14	22·73
Gwanda (Railway)	0·40	—	—
Lamulas	0·16	0·06	19·25
Langalanga	0·12	...	20·88
Mahalali	...	...	16·82
Manantji	0·29	...	—
Mazunga	0·33	0·05	16·23
Mapande	—	...	—
Mrandas	0·48	0·35	—
Mtshabezi Mission	0·40	0·05	19·78
Mwanezi (n.s.)	0·60	0·10	—
Sovelele	1·92	0·10	—
Tuli	...	—	—
West Nicholson (Railway) ...	0·50	—	—
Gwelo— ...			
Daisyfield	...	—	
Dawn	...	—	—
Globe and Phœnix Mine ...	0·04	—	—
Globe and Phœnix (Railway) ...	—	...	25·36
Gwelo (Gaol)	0·12	...	28·63
Gwelo (Railway)	—	—	—
Hunter's Road	0·09	...	27·54
Lalapanzi (Railway)	...	...	30·49
Lovers' Walk	0·05	...	28·58
Lower Gwelo (Somerset Estate) ...	...	—	—
Oaklands	0·46	0·08	35·24
Rhodesdale Ranche	...	...	26·41
Rio (n.s.)	0·29	—	—
Riverdale (n.s.)	—	...	—
Sikombela Farm	0·10	—	—
Woodendhove	—	—	—
Insiza—			
Albany	0·15	...	24·32
Filabusi	...	—	—
Fort Rixon	...	...	28·39
Infiningwe	0·36	...	25·76
Insiza (Railway)	0·10	—	—
Inyezi Farm	0·22	...	20·55
Orangedale	—	—	—
Roodebeuvel	0·61	0·08	30·34
Shangani (Railway)	—	—	—
Thornville	...	...	24·67
Matobo— ...			
Holly's Hope	0·25	—	—
Matopo Mission	0·57	0·07	26·95
Rhodes Matopo Park ...	0·28	0·03	28·06

RAINFALL *(Continued)*.

STATION	May	June	Total for 1918-19.
MATABELELAND—(Continued)			
Nyamandhlovu—			
Edwaleni	—	—	—
Impondemi	—	—	—
Kalaka (n.s.)	0·27	...	—
Melinakanda Junction ...	—	—	—
Naseby Farm	0·02	—	—
Nyamandhlovu (Railway) ...	—	—	—
Sebungwe—			
Gokwe	0·15	...	33·10
Inyoka	...	...	29·78
Selukwe—			
Hillingdon	0·57	0·12	35·17
Selukwe (Railway)	1·31	0·22	41·21
Umzingwane—			
Balla Balla (Railway) ...	1·16	—	—
Crombie's Hotel	—	—	—
Essexvale	0·33	...	27·95
Heany Junction (Railway) ...	0·20	—	—
Hope Fountain	—	—	—
Ntabenende	0·41	...	36·80
Springs Farm	0·22	...	28·79
Wankie—			
Dett (Railway)	—	—	—
Guyo	—	—	—
Lynwood Estate	0·30	—	—
Matetsi (Railway)	—	—	—
Ngamo (Railway)	0·26	—	—
Victoria Falls	...	...	33·32
Victoria Falls (Railway) ...	—	—	—
Wankie Hospital	...	...	25·17
Wankie (Railway)	—	—	—

(n.s.) means new station, and records not in existence for whole season.
... means nil.
— means no return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1919 August	1919 September	1919 October
Beatrice Road	Various farmhouses	A. V. Johnson	No	fixed dates	
Bembesi	Queen's Mine Hotel	V. C. Andrews	1	5	3
Bindura	Bindura	G. Askew	9	13	11
Bromley	Bromley	C. J. Shirley	7	4	2
Charter—Mgezi	Beatrice Mine	W. Krienke	27	..	29
Central	Umvuma	W. A. James	30	27	25
Eastern Border (South Melsetter)	Helvetia	———	8	12	10
Enterprise	Arcturus Hotel	R. Philip	6	3	1
Felixburg—Gutu	Felixburg	R. H. Brown	..	13	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	2	..	4
Gatooma	Gatooma	T. J. Golding	16	20	18
Gazaland	Chipinga	J. Myers	..	10	..
Greystone	Various farm houses, Shangani	M. Kerr	9	13	11
Hartley	Hartley	W. M. Leggate	9	5	4
Headlands	Headlands	J. Grewar	30	..	25
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	9	13	11
Insiza—Shangani	Shangani	M. E. Weale	..	6	..
Inyanga	Farm Cheshire	F. W. Thiel	30	27	25
Inyazura	Inyazura	H. B. Curling	20	17	15
Iron Mine Hill	Iron Mine Hill	T. Irving	9	13	11
Lalapansi	Lalapansi	B. J. Ingle	16	20	18
Lomagundi	Sinoia	A. H. Layard	Saturday	nearest full	moon
Macheke	Macheke	———	No	fixed dates	
Makwiro	Makwiro	D. M. Syme	15	19	17
Makoni North	Makoni	J. G. Monckton	30	27	25
Makoni	Rusape	R. C. Maclagan	9	13	11
Marandellas, Northern	Marandellas Farmers' Hall	A. Nicholson	2	6	4
Marandellas, Southern	Inoro	J. Gibberd	6	3	1
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	6	3	1
Mashonaland, Northern Section	Various	T. H. Newmarch	No	fixed dates	
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed dates	
Matopo Branch, R.L. and F.A.	Sibali	———	..	10	..
Mazoe	Glendale Siding	R. C. Yeoman	13	10	8
Melsetter (North)	Various farms	N. N. Rutherfurd	..	6	..
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	8	12	10
Northern Umtali	Farm Summerfield	R. O. H. Blurton	..	6	..
Norton and District	Norton Store	W. Wrench	2	6	..
Que Que	Que Que	E. J. Ross	16	20	18
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	29	26	31
Selous	Makwiro	A. L. Douglas	16	20	18
Selukwe	Selukwe	F. S. Clark	No	fixed dates	
Shamva	Shamva	R. C. Frith	..	17	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	13	..
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	16	13	11
Umtali	Christmas Pass Hotel	J. S. Holland	2	6	4
Victoria	Victoria	———	1	5	3
Victoria Midlands	———	G. F. Robertson			

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Bromley	Bromley	C. J. Shirley	7	4	2
Charter—Mgezi	Beatrice Mine	W. Krienke	27	..	29
Central	Umvuma	W. A. James	30	27	25
Eastern Border (South Melsetter)	Helvetia	——	8	12	10
Enterprise	Arcturus Hotel	R. Philip	6	3	1
Felixburg—Gutu	Felixburg	R. H. Brown	..	13	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	2	..	4
Gatooma	Gatooma	T. J. Golding	16	20	18
Gazaland	Chipinga	J. Myers	..	10	..
Greystone	Various farm houses, Shangani	M. Kerr	9	13	11
Hartley	Hartley	W. M. Leggate	9	5	4
Headlands	Headlands	J. Grewar	30	..	25
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	9	13	11
Insiza—Shangani	Shangani	M. E. Weale	..	6	..
Inyanga	Farm Cheshire	F. W. Thiel	30	27	25
Inyazura	Inyazura	H. B. Curling	20	17	15
Iron Mine Hill	Iron Mine Hill	T. Irving	9	13	11
Lalapansi	Lalapansi	B. J. Ingle	16	20	18
Lomagundi	Sinoia	A. H. Layard	Saturday	nearest full	moon
Macheke	Macheke	——	No	fixed dates	
Makwiro	Makwiro	D. M. Syme	15	19	17
Makoni North	Makoni	J. G. Monckton	30	27	25
Makoni	Rusape	R. C. Maclagan	9	13	11
Marandellas, Northern	Marandellas Farmers' Hall	A. Nicholson	2	6	4
Marandellas, Southern	Inoro	J. Gibberd	6	3	1
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Matopo Branch, R.L. and F.A.	Sibali	——	..	10	..
Mazoe	Glendale Siding	R. C. Yeoman	13	10	8
Melsetter (North)	Various farms	N. N. Rutherfurd	..	6	..
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	8	12	10
Northern Umtali	Farm Summerfield	R. O. H. Blurton	..	6	..
Norton and District	Norton Store	W. Wrench	2	6	..
Que Que	Que Que	E. J. Ross	16	20	18
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	29	26	31
Selous	Makwiro	A. L. Douglas	16	20	18
Selukwe	Selukwe	F. S. Clark	No	fixed dates	
Shamva	Shamva	R. C. Frith	..	17	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	13	..
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	16	13	11
Umtali	Christmas Pass Hotel	J. S. Holland	2	6	4
Victoria	Victoria	——	1	5	3
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No. 170. Production of Pedigree Seed—Maize, by H. Godfrey Mundy, F.L.S.
No. 174. Notes on Hop Growing, by H. Godfrey Mundy, F.L.S.
No. 176. The Cultivation of Castor Oil Beans, by H. Godfrey Mundy, F.L.S.
No. 179. Buckwheat, by H. G. Mundy, F.L.S.
No. 181. Sunflower Cultivation, by H. G. Mundy, F.L.S.
No. 188. The Ground-Nut or Monkey Nut, by H. Godfrey Mundy, F.L.S.
No. 193. Oats in Southern Rhodesia, by H. Godfrey Mundy, F.L.S.
No. 194. Rye, by J. A. T. Walters, B.A.
No. 201. Dhal or Pigeon-Pea, by J. A. T. Walters, B.A.
No. 207. Crop Rotation in Southern Rhodesia, by J. A. T. Walters, B.A.
No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.
No. 232. Witch Weed or Rooi-Bloem, by J. A. T. Walters, B.A.
No. 235. Crops Unsuitable to Southern Rhodesian Conditions, by J. A. T. Walters, B.A.
No. 244. New Crops for Rhodesia, by J. A. T. Walters, B.A.
No. 251. Cultural Notes on Onions, by J. A. T. Walters, B.A.
No. 252. Cultural Notes on Buckwheat, by J. A. T. Walters, B.A.
No. 253. Wheat Production in Southern Rhodesia.
No. 258. Winter Wheat, by J. A. T. Walters, B.A.
No. 262. Root Crops, Cultural Notes on, by J. A. T. Walters, B.A.
No. 278. New Crops for Rhodesia, by J. A. T. Walters, B.A.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

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No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.
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No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
No. 316. Inoculation of Cattle against Redwater and Gall-sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 324. Infectious Abortion of Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
Services of Government Veterinary Surgeons.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 238. Compulsory Dipping, by E. A. Nobbs, Ph.D., B.Sc., and J. M. Sinclair, M.R.C.V.S.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist.
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 282. Management of Dipping Tanks, by J. M. Sinclair, M.R.C.V.S.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 314. Tampan or Poultry Tick, by A. Little.
No. 319. The Turkey, by Arthur Little.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.

No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 325. Contagious and Infectious Diseases of Poultry, by A. Little. Strength of Cattle Dips.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 205. Home Butter Making, by R. C. Simmons.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 226. Classification of Clouds.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 285. The Mexican Marigold, by F. Eyles, F.L.S.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 298. Pise Tobacco Barns, by D. L. McLachlan.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
Malarial Fever: How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Game Law: Summary of.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Irrigation—Advice.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS WANTED.

E. V. C.—As assistant on farm or ranch. Experience in Cape Colony and several years in Rhodesia. Age 25 years. Good references.

A. P. N.—As assistant on farm or partner, with share of profits. Experience in general and stock farming in Transvaal. Age 30 years. Just returned from western front after several years' service with commissioned rank.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal*. This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 232 of 1919.] [23rd June, 1919.

"WATER ORDINANCE, 1913."

IT is hereby notified that His Honour the Administrator has been pleased to make the following grant under the "Water Ordinance, 1913":—

To *Frederick Head*, in respect of the land known as sub-division "B" of the farm Reigate, in the district of Bulawayo, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use from an unnamed river on the northern boundary of the said farm such quantity of public water as can be beneficially and economically used for the irrigation of ten acres of land riparian to the said river on the said farm, subject to the following conditions:—

(1) That in this grant the quantity taken for beneficial use shall be extracted from such public water as remains after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm sub-division "B" of Reigate, in extent approximately 70 morgen. On any sub-division of the farm, this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use and thereafter to use a reasonable share of the water in the said river.

(4) That this grant shall be subject to revision at any time if and when fuller information is available respecting the flow of the said river, and it may then be converted into authority to use a definite proportion of the normal flow.

Dated the thirtieth day of April, one thousand nine hundred and nineteen.

No. 264 of 1919.] [27th June, 1919.

"WATER ORDINANCE, 1913."

WITH reference to Government Notice No. 220 of 30th May, 1919, appointing a Water Court for the purposes set out therein, it is hereby further notified that His Honour the Administrator has been pleased, under and by virtue of the powers conferred on him by the "Water Ordinance, 1913," to require the said Court to report for his information on such questions touching the use and apportionment of the water in the Odzani and Umtali Rivers as it may not be authorised to make decisions upon in terms of the said notice.

No. 288 of 1919.] [11th July, 1919.

"WATER ORDINANCE, 1913."

IT is hereby notified that His Honour the Administrator has been pleased to make the following grant under the "Water Ordinance, 1913" :—

To *The British South Africa Company*, in respect of the land known as Withington Farm, in the district of Inyanga, under the powers conferred by the "Water Ordinance, 1913," the right to divert, impound, take and use from the Inyongombie River such quantity of public water as can be beneficially and economically used for the irrigation of 13 acres of land riparian to the said river on the said farm, subject to the following conditions :—

(1) That in this grant the quantity taken for beneficial use shall be extracted from such public water as remains after all rights (if any) of upper proprietors have been satisfied.

(2) That this grant is in respect of the whole of the farm Withington, in extent approximately 1,515 morgen. On any sub-division of the farm, this grant shall be subject to revision, in order to secure an equitable distribution of the water to the sub-divisions.

(3) That this grant is issued subject to the right of all others to whom the use of water may be lawfully granted to obtain the right to use, and thereafter to use, a reasonable share of the water in the said river.

(4) That this grant shall be subject to revision at any time if and when fuller information is available respecting the flow of the said river, and it may then be converted into authority to use a definite proportion of the normal flow.

Dated the nineteenth day of June, one thousand nine hundred and nineteen.

No. 255 of 1919.] [27th June, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the powers vested in him by section 5 (6) (d) of the "Animals Diseases Consolidation Ordinance, 1904," to declare that the following regulations shall from date hereof be in force and effect :—

No person shall import any bones (for use), or any material wholly or partially manufactured or derived from bone, such as bone meal, bone flour, bone dust, dissolved bones, bone compound or the like, unless such bones shall have been sterilised by subjection either to—

(a) a dry heat of 140 deg. centigrade for not less than three hours; or

(b) a moist heat (under pressure) of 105 deg. centigrade for not less than fifteen minutes.

A declaration to this effect shall be furnished by the importer with the application for registration under section 1 of Government Notice No. 421 of 1914, and, further, in any sale effected the seller shall furnish to the buyer the said declaration, in addition to the invoice required by sections 6 and 7 of the said notice.

Any person contravening these regulations shall be liable to the penalty provided under the Ordinance.

If at any time it shall subsequently appear that any person has made such declaration falsely, he shall be liable to the penalty provided under the Ordinance.

[This notice replaces Notice No. 261 of 1917.]

No. 257 of 1919.] [27th June, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," as amended by the "Animals Diseases Amendment Ordinance, 1910," to declare the following diseases of poultry to be destructive diseases coming under the operation of the said Ordinance :—

Spirochætosis.	Tuberculosis.
Cœcidiosis.	Bacillary enteritis.
Fowl cholera.	Roup.
White diarrhœa	Diphtheritic roup.

No. 273 of 1919.] [4th July, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 61 of 1919, as amended by Government Notice No. 183 of 1919, declaring the farms Burnleigh and Bamboo Creek, in the Mazoe native district, an area of infection.

No. 289 of 1919.] [11th July, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 411 of 1918, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following areas of infection and guard area in lieu thereof :—

VICTORIA NATIVE DISTRICT.

(a) *Areas of Infection.*

The farms Beza, Morgenstar, Zimbabwe and Mzero.

(b) *Guard Area.*

The farms Riverdene, Riverdene Extension, that portion of Ballinahone lying south of the farm road from Victoria, Beauly, Bannockburn, Mlinya Reserve, Wayne, Bompst, Erichsthal, Barquest, Ratcliffe, Lounton, Midwaters, Gorge Grange, Sikato, Longdale, Tentergate, Victoria native reserve, unalienated land lying south of the Victoria reserve and north of the Makorsi River Ranche, Mtilikwe native reserve, The Retreat, Le Rhone, and Oatlands.

No. 303 of 1919.] [18th July, 1919.

"ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904."

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 201 of 1919, and in terms of section 17 of Government Notice No. 21 of 1917 declare the following area of infection and guard area in lieu of those fixed by the first mentioned notice :—

MAZOE NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Avonduur, Leopards' Vlei, Wolf Hill and Glen Divis.

(b) *Guard Area.*

The farms Erin, Wiseacre, Gosforth, Kasipa, Dalnagreine, Rocky Spruit, Geluk, Simoona Reserve and Pimento Park.

No. 262 of 1919.] [27th June, 1919.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farm Clearwater, Gwelo native district, His Honour the Administrator has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to declare the following area to be actively infected with African Coast Fever for the purposes of the said Ordinance.

Description of Area.

The Gwelo native district, and the farms Elliott, Umtabekwe, Highlands, Safago, Home, Slades, Lancastershire Estate, Wallclose, Beacon Kop, and the Engesi Source in the Selukwe native district.

No. 266 of 1919.] [27th June, 1919.

AFRICAN COAST FEVER.

WHEREAS there has been an outbreak of destructive disease—to wit, African Coast Fever—on the farm Avonduur, Mazoe district, His Honour the Administrator in Council has been pleased, under the powers vested in him by the "Animals Diseases Amending Ordinance, 1911," to declare the following area to be actively infected with African Coast Fever for the purposes of the said Ordinance.

Description of Area.

An area in the Mazoe native district comprising the following farms:—Avonduur, Leopards' Vlei, Wolf Hill, Glen Divis, Erin, Wiseacre, Gosforth, Kadipa, Dalnagreine, Rocky Spruit, Geluk, Simoona Reserve and Pimento Park.

No. 258 of 1919.] [27th June, 1919.

IMPORTATION OF POULTRY.

HIS Honour the Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Oridnance, 1904," as amended by the "Animals Diseases Amendment Ordinance, 1910," to cancel Government Notice No. 375 of 1912, and provide as follows:—

1. All poultry imported by rail shall be inspected by an Inspector or Sub-Inspector at Bulawayo or Umtali.

2. Should any consignment of poultry shew symptoms of a destructive disease, or should such Inspector or Sub-Inspector have reason to believe that any such disease exists or that infection is likely to be conveyed by such consignment, he may order the detention, pending examination by a Government Veterinary Surgeon, who, after inspection, may order the destruction, isolation or return of such consignment beyond the borders of the Territory, and, further, may prescribe such measures for the disinfection of trucks, crates or other containers as he may deem necessary.

No. 256 of 1919.] [27th June, 1919.

CITRUS CANKER.

HIS Honour the Administrator has been pleased, under and by virtue of the powers conferred upon him by the "Importation of Plants Regulation Ordinance, 1904," to amend Government Notice No. 87 of 1919 by the addition of the words "or any other adjoining territory" after the words "from the Union of South Africa" where they occur therein.

Mr. C. S. Jobling's grade Herefords, winners of three firsts at Witwatersrand Fat Stock Show, 10th September, 1919.

THE RHODESIA

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assisted by the Staff of the Agricultural Department.

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Editorial.

Correspondence on subjects affecting the farming industry of Southern Rhodesia is invited. Enquiries will be replied to direct, or through the medium of the JOURNAL. *An interchange of ideas and suggestions between farmers will be particularly welcomed. Contributions of a suitable nature for insertion in this* JOURNAL *will be much appreciated. All communications regarding these matters, and advertisements, should be addressed to the Editor, Department of Agriculture, Salisbury.*

The Cure of Fly-Struck Live Stock.—We publish in this issue an article of exceptional interest and value, prepared by Mr. H. E. Hornby, O.B.E., Government Veterinary Surgeon, Fort Jameson, Northern Rhodesia, in which he deals very instructively with the subject of tsetse fly disease of live stock. The vast area of the African continent rendered useless for farming and even for human occupation, and the very fatal nature of fly-borne diseases, alike render the study of tsetse a matter of incalculable importance. The obvious remedy, elimination of the fly, is beset with many practical difficulties, but fortunately the

medicinal treatment indicated by Mr. Hornby appears to offer some hope of successfully combating the malady.

Not only Rhodesian farmers, but a much wider circle of the public will be keen to learn the results with large numbers of animals of the use of the drugs indicated, and which it is to be noted have already been so far proved that the writer, without hesitation, names them and states the effective doses.

Wheat.—During recent years the necessity for increasing wheat production in Rhodesia was constantly urged, and that this has not been without some effect is shewn by the following figures:—

	Winter Crop.		Summer Crop.	
	Acres.	Estimated Yield.	Acres.	Estimated Yield.
1914-15 ...	1,364	5,489 bags	321	750 bags
1915-16 ...	1.185	3,559 bags	866	2,397 bags
1916-17 ...	3,121	9,363 bags	1,534	3,031 bags
1917-18 ...	3,756	11,265 bags	1,265	2,541 bags
1818-19 ...	3,126	10,000 bags	830	2,136 bags

In the past the lack of a local market for Rhodesian-grown wheat was a serious hindrance to increased production, but this has now been overcome by the opening of flour mills in Gwelo and Salisbury. The latter, we are informed, can deal with 50,000 bags of wheat per annum, and at present is mainly dependent upon the Union for its supplies. This fact, coupled with the prospect of steady prices for some years to come, should be incentive enough for greater efforts towards increased production.

About half of our winter wheat crop is grown without irrigation on moisture-retaining soils, and there is unquestionable scope for extension in this line of cropping throughout many of the sand veld districts. Wheat grown without irrigation is not an expensive crop to produce, and at £2 per bag should seldom be other than profitable.

There is at present greater opportunity of increasing production by this form of cropping than either as an irrigated or as a summer crop, and with a local market assured, farmers should feel justified in preparing considerably larger areas of land for winter wheat. It is hoped that during next February and March the Department of Agriculture will be in a position to supply, free of charge, seed of several new varieties, some of which may prove better suited to local conditions than those at present being grown.

Veld Fires.—In connection with recent references to this subject in the *Journal*, we have received, through the kindness of Mr. Lees, of Alali Farm, Matobo, particulars of the methods followed successfully by the Matobo Farmers' Association since 1916 for the purpose of employing special native fire police to combat grass fires.

The following circular is issued each June to the residents, stockowners and landowners of the Matobo district:—

"THE MATOBO FARMERS' SPECIAL NATIVE FIRE POLICE.

"*Object.*—To enrol, pay and ration three special native constables for the months of July, August, September and October, who are to be under the sole orders, control and direction of the O.C. the Police Force in the Matobo district. The first and primary duty of these S.N.C.'s is to patrol the area defined, to call on and turn out all residents within a radius of three miles of any farm, store, homestead, kraal or other habitation, and with their help to extinguish any veld or grass fire that may be burning, to enquire into the origin of any such fire and to arrest and prosecute any offender under the Herbage Preservation Ordinance, 1913, should evidence justify such a course.

"*Area.*—All that portion of the Matobo district adjacent to and situated south of the Matopo range of hills.

"*Contributions.*—Should more subscriptions be obtained than are requisite for the above purpose, then a larger number of constables could be enrolled, the area extended to include the northern portion of the district, or the amount could be carried forward to next year, as may be decided on. In practice the cost works out at about one shilling a day for each native employed, or £4 10s. per mensem for three. The Government will be requested to detail for the above duty an equal number of native constables to the number enrolled and paid for by this association."

Farmers have more or less readily contributed the necessary funds each year. The system has worked well, several fires having been extinguished before great damage has been done, and several convictions obtained each season. The chief value, however, is preventive, and natives and Europeans alike hesitate to set the veld alight when they know that special native constables are on the alert to prevent it. We publish elsewhere in this issue a letter on the subject from Mr. Lees, and it is satisfactory to learn that the local police have freely rendered all assistance possible in this work.

Cattle from Overseas.—We reproduce in this number a leaflet issued by the British Board of Agriculture and Fisheries, in which information is given in regard to the cattle-testing station at Pirbright, England. In this connection it is necessary to amplify the remarks contained in an editorial reference to the matter in the last number of this *Journal* to the effect that "no cattle arriving at the Union ports from Great Britain on or after the 1st November will be allowed to land unless they are accompanied by a certificate signed by the officer in charge of

the Quarantine Station, Pirbright, to the effect that they have passed through the station and successfully passed the tuberculin test immediately prior to embarkation." It should be noted that only cattle which are shipped with others destined for the Union are required to have the official certificate of testing at Pirbright. Special consignments of cattle for Rhodesia, *i.e.*, cattle coming on ships on which there are no cattle for the Union, do not require the Pirbright certificate. They will be allowed to land at Union ports and allowed to proceed to this Territory without detention.

Farmers' Days.—At Gwelo, on the 17th and 18th October, following on the lines of the day devoted at the Salisbury Agricultural Show to lectures and demonstrations, a gathering of farmers took place devoted entirely to agricultural instruction. The arrangements were made under the auspices of the Midland Farmers' Association, and with the exception of an enjoyable dance on the evening of the first day, the entire programme was of an educational character. The syllabus included the following subjects: Points in judging cattle, Dr. E. A. Nobbs; Stock Diseases, Mr. L. E. W. Bevan; Poultry Farming, Mr. A. Little; Fruit, Mr. A. G. Turner; Selection of Maize Seed, Mr. C. Mainwaring; Agricultural Statistics, Mr. F. Eyles.

Reports of the lectures have appeared in the Press, and it is only necessary to add that the success of the meetings was most marked and the attendances large and interested. The keenness displayed by farmers to attend these gatherings justifies their repetition at other centres whenever suitable arrangements can be made.

Export of Breeding Cattle to Transvaal.—The export of breeding cattle from Southern Rhodesia *via* Liebig's Drift into the Transvaal is now allowed in terms of Union Government Notice No. 1062 of 13th August, 1919, and Union Government Notice No. 855 of 24th June, 1919, under permit from the Chief Veterinary Surgeon, Salisbury, and subject to 30 days' quarantine on arrival in the Union under the supervision of the Union Government at a fee of 2/6 per head. As one of the conditions is that the animals must be tick-free, a dipping tank is being erected at Liebig's Drift on the Rhodesian side. At present such cattle can only be moved to the Zoutpansberg district in the Transvaal.

South African Stud Book Association.—Members of the various breed societies affiliated under the South African Stud Book Association, and they include most if not all prominent Rhodesian breeders, will be aware of the proposal on foot to obtain statutory recognition in the Union of their organisation, and to grant to it by law the right to be the exclusive body empowered to make and preserve records of pure-bred live stock. The desirability of such incorporation is obvious, and

will have the support of all breeders of stud stock. At present there is nothing to prevent any group of persons from compiling stud books with no guarantee as to the authenticity or reliability of the records.

How far such a body or such a law in another country could be recognised in this Territory is a matter for consideration.

The Maize Growers', Breeders' and Judges' Association.—The first general meeting of the newly-formed Maize Growers', Breeders' and Judges' Association of Rhodesia, Southern and Northern, and the Mozambique Companies' Territories, was held at the Commercial Hotel, Salisbury, on 3rd October. The president, Mr. George Duthie, Devondale, P.O. Concession, occupied the chair, and during the meeting the constitution of the association and the appointment of the executive committee were duly ratified. In addition to the first vice-president, Mr. F. C. Peek, of Concession, Mr. Walter Pepworth, president of the South African Maize Breeders', Growers' and Judges' Association, was also nominated a vice-president. The work of the two associations must be closely allied, and it has been decided that the president of each shall be *ex-officio* a vice-president of the other. In addition to the above, the following gentlemen form the executive committee:—Messrs. D. Black (Salisbury), J. E. Dawson (Salisbury), Allan Curling (Inyazura), T. Honey (Acting Director of Agriculture, Beira), W. Humphreys (Department of Agriculture, Beira), V. W. Fynn (Concession), M. Inge (Lomagundi), H. Kneiser (Lomagundi), A. R. Morkel (Shamva), R. S. Newett (Wolf Hill), George Rattray (Bindura), H. D. Rawson (Enterprise), Arnold Pearson (Makwiro); also Dr. E. A. Nobbs (Director of Agriculture), and Messrs. Mundy, Walters, Mainwaring and Taylor (Department of Agriculture), Salisbury.

The association has for its sole object the encouragement of the maize-growing industry, and is deserving of the support of every arable farmer in Rhodesia. Some of its more important functions will be:—(a) The improvement of maize by securing better methods of seed selection and the better production of pure-bred seed; (b) assistance to agricultural societies in preparing their prize lists for maize and in nominating qualified judges; (c) assistance to and protection of breeders of high-grade seed and assistance to growers in obtaining such seed.

It is anticipated that later on the society will be able to organise maize-growing competitions which should prove of very great interest and value to the districts in which they are carried out. In future, too, the various maize-growing experiments on the Government experiment stations of Southern Rhodesia will be planned and carried out in consultation with the association, and it is hoped under the not infrequent inspection of its members.

The subscription is one guinea per annum, and there is no doubt that, if well supported by growers and energetically conducted, the association will prove a power for much good in the country.

Mexican Marigold or Stinking Roger (*Tagetes glandulifera*).—In view of the spread of Mexican marigold on many Rhodesian farms, the following extract from the *Queensland Journal of Agriculture* will be read with interest. While it is not likely in so luxuriant a grass country as this that the marigold will be eaten freely by sheep or goats, it might perhaps be possible to herd or paddock them on infected areas when the plants are young, and so to prevent seeding. Failing the feasibility of this, and if the plant is found to be good fodder, the expense of cutting it on infected areas before it can seed may be counterbalanced by the value of it as a feed to kraaled sheep or goats.

The passage referred to reads as follows:—

"Lately we were asked if the ill-smelling weed known as 'Stinking Roger' could be utilised in any way for fibre or stock feed. We had never heard that this pestiferous plant was of any use economically, but the following paragraph in the Perth 'Farmer' would lead to the belief that it may be good sheep feed. That journal says:—

" 'Giving evidence before the Royal Commission on Agriculture in October, 1916, Mr. Maitland Leake, referring to the prevalence of weeds, said: "There is a farm adjoining us which is entirely overrun with stinking Roger. It has completely spoiled his crop, with the exception of about 30 acres. . . . It is good sheep feed and we are keeping it down (with sheep). We have neighbours on either side who have the Roger on their land, but it has not affected us because we can keep it down. Sheep do wonderfully well upon it. Mr. Heuston will be giving evidence, and he will tell you how long he has had sheep on the Roger and how well they have done on it. I have been surprised myself."

" 'Mr. Heuston, to whom Mr. Leake referred above, gave evidence on this plant later. He said: "We run 400 sheep at the present moment. We have only been running stock during the last twelve months, but during the last four months 150 acres would carry 400 sheep. That is because of the stinking Roger. Possibly settlers in the very dry areas may even find a welcome for it." ' "

The South African Poultry Conference.—The sixteenth annual conference of the South African Poultry Association was held at Pretoria from the 10th to 15th November. There are 63 poultry clubs and societies affiliated to the association. Fifty clubs were represented by delegates from the Union, and in addition four of the five Poultry Experts of the Union were present. Rhodesia was represented by its Poultry Expert, Mr. A. Little, and one delegate from each of the two affiliated clubs, viz., Bulawayo and Salisbury—the secretary of the Poultry Club, Mr. Mercer, representing the former, and Mr. Basden, a proxy, the latter.

The conference was opened by the Minister of Commerce and Industries, the Hon. Mr. Malan. Mr. F. B. Smith, the Secretary for Agriculture, was present on the first and second days. There were 105 resolutions on the agenda, 27 of which were from Bulawayo and 14 from Salisbury, the majority of which were carried. It was decided to hold the next annual conference at Bulawayo towards the end of October or

the beginning of November next year, and this may be regarded as a compliment to Rhodesia.

In regard to the agenda, it is of interest to quote from "The South African Poultry Magazine." Thus:—

"It is most encouraging to see the live interest shewn by the Rhodesian clubs. At the same time it causes one to think furiously why such matters as the following, which only affect the Union, should have been thought of and tabled by them, and yet were either overlooked or not thought necessary for discussion by clubs in the Union:—

1. Appointment of poultry members on the Agricultural Advisory Board of Government.
2. Legislation in fowl ticks.
3. Egg substitutes sold in South Africa.
4. Sizes of crates, tariffs and concessions on the railways."

A resolution brought forward by the Rhodesian delegates dealing with the selling of dead poultry and eggs by weight and grades was carried, as was another having for its object the protection of that section of the poultry industry concerned with the marketing of live birds. These measures are of prime importance to the poultry industry.

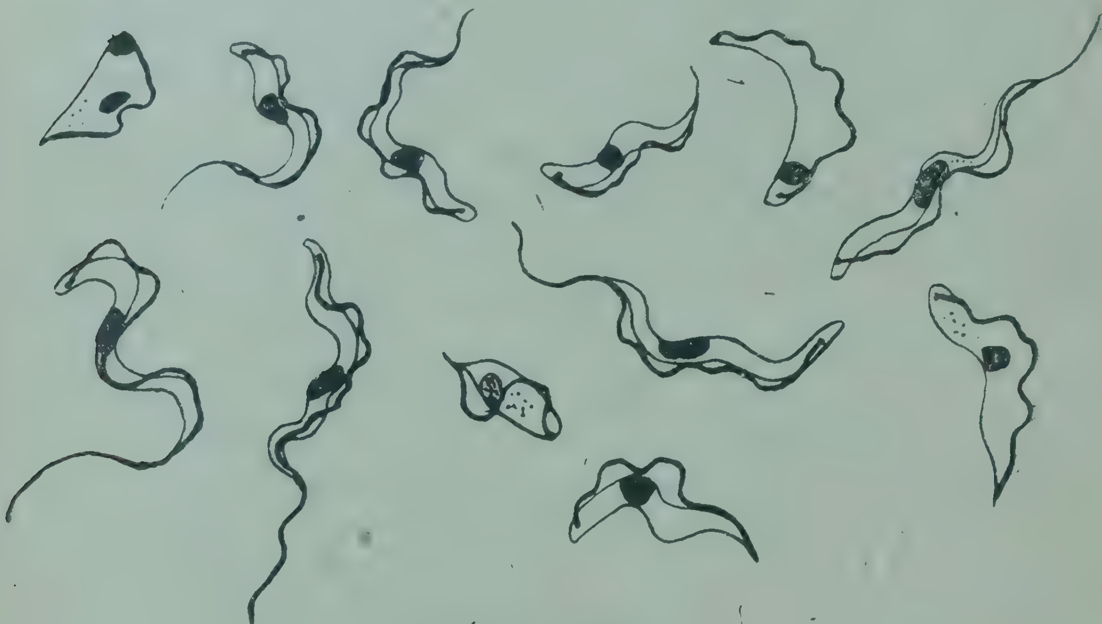
It is intended to form a Provincial Poultry Association in Rhodesia, which will of course be affiliated to the parent body in the Union, and this association, it is anticipated, will be able to initiate measures for the advancement and protection of the poultry industry in this country, which it is pleasing to note is making rapid strides.

Tsetse Fly Disease

IN DOMESTIC AND WILD ANIMALS.

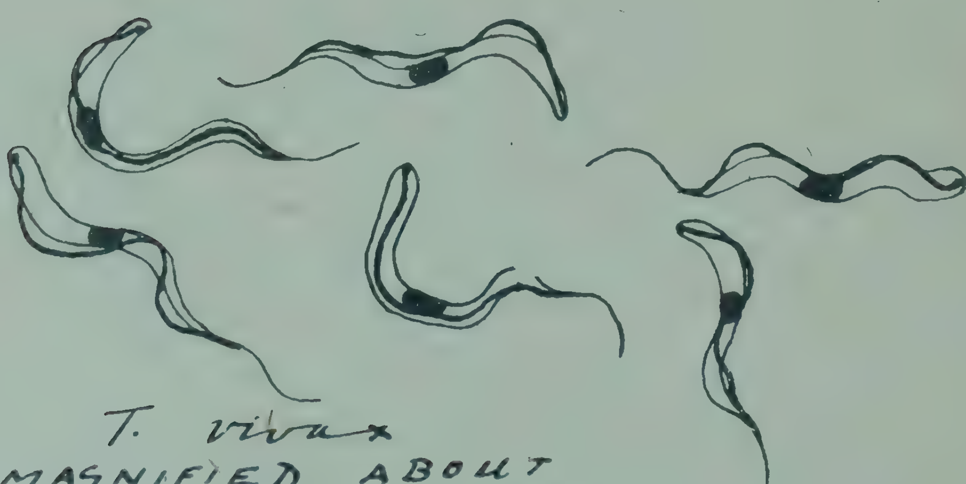
By H. E. Hornby, O.B.E., M.R.C.V.S., D.V.S.M,

Before 1894 it was not known why the bite of a tsetse fly was liable to cause a disease fatal to most domesticated animals. In that year Bruce found that a constant feature of the disease was the presence at some time or another in the sick beast's blood of small organisms resembling those which were already known to science as "trypanosomes." Although they are parasites of the blood of the mammals in which they



T. brucei

T. congolense



T. vivax

ALL MAGNIFIED ABOUT 1500 TIMES

find a suitable habitat, they should be regarded even more properly as parasites of tsetse flies.

In a fly-belt we meet three such widely different kinds of animals as antelopes, tsetse flies and trypanosomes. The first obtain their nourishment directly from plants, the second from the blood of the antelopes and other big game, the third from the blood and tissue fluids of the other two. If the antelope population were to increase unduly, the herbage would be fed off completely, and many of the game would die of hunger. Similarly, if the tsetse multiplied excessively, they would torment and exhaust their hosts to the point of extinction, and the flies, in turn, would then die from lack of food. So with the trypanosomes and their hosts: it is necessary for the survival of the former that they do not multiply to the extent of killing the latter. In the fly-belts undisturbed by man we find, as the result of centuries of natural selection and other evolutionary causes, that antelopes and other herbivora are as numerous as the quantity of winter feed and wild carnivora permit, that the tsetse population varies directly as the big game, and that trypanosomes can survive and multiply in both game and tsetse, though not to the extent of seriously injuring their hosts.

An interesting example of a disturbance of this balance of nature was given by Mr. C. F. M. Swynnerton when speaking at a meeting of the Rhodesia Scientific Association (as reported in the "Bulawayo Chronicle"). It is well known that the great rinderpest epizootic of the end of last century coincided with a marked decrease in fly. Mr. Swynnerton seems to think that the explanation is to be sought in the facts that during the winter months the fly areas contract to those affording sufficient shade, and if it were while the flies were thus concentrated that the rinderpest killed off the wandering game, not only was the total food supply of the tsetse greatly diminished, but the carriers which they annually accompany back to their wider summer haunts were destroyed. Left concentrated in a small area without sufficient food, decimation from famine and disease followed.

What happens when man and his domesticated animals go into a fly-belt? The tsetse have long since learnt to feed on and digest the blood of such diverse species of mammals as antelopes, buffalo, zebra, warthog, and probably elephant and wild dog. They are thus able to attack and bite man and his dependants, and to nourish themselves on the blood so obtained. The trypanosomes present in these tsetse have learnt likewise to adapt themselves to many sorts of blood, although in the evolutionary period during which they were being thus modified their usual mammalian hosts were synchronously learning to turn out antibodies into their blood which prevent the trypanosomes doing much harm while there; in fact, there is reason for believing that trypanosomes do not thrive very well in game blood, but soon die out in it when the game wander out of the fly-belts. When the trypanosomes, then, are injected by a tsetse into a domesticated animal they meet with none of these inherited antibodies which the game possess, and so they are able to multiply to the extent of killing the host. Rarely is a susceptible domestic mammal able to manufacture antibodies quickly enough, or strong enough, to kill all the invading parasites; as a rule the most

it can do is to retard the progress of the disease to the extent of making the condition chronic. If a parasite, like *T. vivax*, has not learnt during the course of its developmental history, by passage through the blood of wild carnivora, to adapt itself to dog's blood, it will die when injected into this animal. Similarly most trypanosomes cannot survive in human blood, because this differs widely in some respects from any blood that tsetse have been in the habit of feeding on. In those parts of Africa where tsetse and man have associated for a number of decades the trypanosomes have learnt to adapt themselves accordingly, and sleeping-sickness has been the result.

I have recently published an article entitled "Trypanosomes found in Domesticated Mammals in South-Central Africa," and I summarised the results of my research as follows:—

(1) The common trypanosomes are three in number, viz., *Trypanosoma brucei*, *T. congolense* and *T. vivax*.

(2) They are readily distinguishable by their morphological characters and by their modes of development in the fly.

(3) *T. brucei* is very fatal to equines, goats, sheep and dogs, but it is almost non-pathogenic for cattle.

(4) *T. congolense* is the commonest cause of trypanosomiasis of cattle, but it is also pathogenic for the other domestic mammals.

(5) *T. vivax* resembles *T. congolense* in the forms of disease it causes in stock. Dogs are generally immune to its ill effects.

(6) The distribution of these parasites is coincident with that of tsetse flies.

(7) Different strains of the same species of trypanosome vary greatly in their range of virulence.

(8) Individuals and races of the same species of domesticated animal vary greatly in the resistance they offer to infection.

(9) The presence in the blood of one species of trypanosome appears to inhibit the development of the others.

(10) A fourth species—*T. simiæ*—causes disease in pigs. It is conceivable, though, that this may be only a variety of *T. congolense* modified by passage through the warthog.

A glance at the accompanying plate will give the reader some idea of what are the shapes of trypanosomes when killed, stained and seen under a microscope of high power.

The Government Entomologist of Southern Rhodesia, in an excellent article contributed recently to this *Journal*, informed us that more than one species of tsetse is found in that country. It must not be supposed, however, that one species of fly harbours only one species of trypanosome; rather is it true that all four species of trypanosomes can develop in all species of tsetse, although not with equal readiness.

The results of infection by the different trypanosomes resemble one another closely, varying in intensity according to the resistance of the individual host to the particular strain of the parasite. By knowledge of a beast's history and by observation of symptoms a man can diagnose

tsetse fly disease; but only with the aid of a microscope can he determine what is the species of parasite concerned. From a practical point of view the chief importance attached to knowing with what species of trypanosome we are dealing is that diseases due to *T. congolense* and *T. vivax* are curable, whereas at the present time the same can hardly be said of the disease caused by *T. brucei*. In cattle practice we meet with only the first two parasites, and these resemble each other closely in the sickness they cause and in their amenity to drug treatment.

Susceptibility.—All domesticated mammals are susceptible to fly disease. Cattle are naturally immune to *T. brucei*, and dogs to *T. vivax*. Local races of animals may develop a high degree of resistance to local strains of trypanosomes. Age confers no immunity; nevertheless, when an outbreak of the disease occurs, the adult animals die first.

Methods of Infection.—The disease is maintained in the fly-belts, and it is generally introduced into a flock or herd by the bite of a tsetse. It can be spread mechanically by biting flies other than tsetse, if infected and susceptible animals work or graze close together. Young animals can be infected by the milk of an affected dam. The eating of an infected carcase by a dog is not likely to set up disease.

Incubation Period.—This is the time which elapses between infection and first manifestation of symptoms. The first indication of illness is generally a rise of temperature, but it is frequently long after this initial bout of fever that the animal first shews definite symptoms of sickness. Accordingly, although the incubation period of trypanosomiasis is generally between five and ten days, yet symptoms may develop so slowly that a beast may be out of fly a month or six weeks before its general appearance calls the owner's attention to the fact that it is ill. On the other hand, oxen working in fly may hang back in the yoke, be off-feed, dull and weak as the result of fly within ten days of entering a belt; while pigs, in consequence of *T. simiæ* infection, may die within a week of being bitten. I should say that if an animal does not shew signs of disease within three months of its exposure to infection it has escaped being affected. A cold rain falling on an animal incubating the disease will frequently cause a chill and precipitate symptoms.

Symptoms.—These vary somewhat according to the species of mammal attacked. Pigs and European dogs generally suffer from an acute form which kills them within a month, or even a week. Kaffir dogs and small ruminants may shew considerable resistance to infection; but when the disease does develop, they die as a rule within three months. In the large herbivorous mammals the disease generally runs a chronic course, taking from three to twelve months to kill those patients which receive decent attention.

In Equines the first symptoms noticed are that when the animal is ridden or driven it stumbles and tires easily, it is off-feed and has a high temperature, especially in the evening. After a day or two the appetite returns, but the animal remains sluggish and disinclined to work. The legs now begin to fill, and as the disease progresses there may appear other evidences of bad circulation, such as well-defined swellings beneath the belly and chest, œdema of the sheath and even of the face.

Other evidence of anæmia is the appearance of the third eyelid, or *membrana nictitans*. This is best examined by placing the thumb and index finger on the lower and upper eyelids and pressing the eyeball back. According to the degree of anæmia and jaundice the membrane is pale pink, or white with a bluish tinge, or it may be yellow with red blotches. Not rarely the eyeball itself is invaded, and then the front of the eye becomes clouded and the eyelids are kept closed. During the first weeks the fever may be continuous or recurrent, but as the disease assumes a sub-acute or chronic form the temperature chart becomes rather characteristic, being several degrees higher at night than it is in the morning; in a sub-acute case it would be probably 104 or 105 at night and 102 or 103 in the morning; in a chronic case 102 or 103 at night and 99 in the morning. As in all febrile conditions, the rates of pulse and respiration are increased. As the animal loses condition the coat becomes staring, the ears droop, the eyeballs recede, and the weakness and general depression become more marked. Towards the end the beast sways if trotted, and tends to fall if turned sharply. Actual paralysis may precede death. A pregnant mare nearly always aborts. The most important things to notice are that in spite of all these symptoms the animal's appetite is on the whole maintained, and the dung remains normal.

In Cattle the disease may be first noticed when the animal is merely dull, uneasy, has a staring coat, is somewhat off-feed, and, if it be at work, hangs back in the yoke. If the beast receives good attention the appetite soon returns, but the loss of condition proceeds slowly. If an attempt be made to work an affected animal the falling away becomes rapid, and the same thing happens if, as sometimes occurs, the first symptoms are accompanied by diarrhœa. The course of the disease is typically a gradual pining away, although the appetite is fair or good, and rumination and defæcation are normal. Contrary to what happens in the horse or ass, œdematous swellings are rarely seen. The coat becomes harsh, the hair falls out, and in advanced cases a common lesion is the loss of the brush. The third eyelid, which can be examined if the beast's head be turned well over sideways, shews increasing paleness as the disease advances, but it is rarely yellow or blotched. Not often is the eyeball invaded. The temperature of a normal ox is higher at night than it is in the morning, but in a fly-struck one the difference is much greater, being frequently 105 at night and only 99 in the morning. As in all anæmic conditions, the temper of an affected animal may become uncertain. Pregnant cows abort. Progressive weakness is the rule, but true paralysis is hardly ever observed.

Goats and Sheep resist infection better than do the larger animals; consequently one finds flocks near, or even in, fly-belts long after all cattle have disappeared from the neighbourhood. Few or no goats or sheep will resist successive inoculations, because even if they are immune to one species of trypanosome they will sooner or later become infected with another. When the disease is established the affected animals rapidly become thin, and die within two or three months. More rarely they linger for upwards of a year. The temperature chart varies with the species of the infecting trypanosome, the characteristic remittent or intermittent type of fever being most pronounced when the infecting

organism is *T. vivax*. Œdema is rarely seen, save in *T. brucei* infections, when there may be swelling of the face. Infection of the eyeball is rare, but an excessive flow of tears is common.

Dogs, especially kaffir ones, have a natural immunity to *T. vivax*. Those native dogs found close to or in fly belts possess frequently a high resistance or an actual immunity to *T. congolense* as well, and consequently may survive for a long time although repeatedly bitten. When, however, a dog becomes infected with *T. brucei*, or its resistance to the other trypanosome is broken down, it soon gets thin, its coat becomes harsh, its gums and tongue become pale, its eyes water and the cornea often becomes cloudy, and it succumbs rapidly. The usual course of the disease in European dogs is thus an acute one.

Pigs vary in the resistance they offer to infection, but as a rule the disease runs an acute course. Particularly is this the case when *T. simiæ* is the infecting agent.

Post-mortem.—There is absolutely nothing in the *post-mortem* lesions of an animal dead from tsetse fly disease which enables one to say what disease caused death; the lesions are those of any emaciating one. The flesh is flabby and pale; there is absence of fat; the lymphatic glands are enlarged and frequently hæmorrhagic; there may be blood-spots on the inside surfaces of the chest and abdomen; beneath the skin and around the kidneys there may be gelatinous œdema. The main thing to notice is that in uncomplicated tsetse fly disease there is an absence of all gross lesions.

Diagnosis.—If an animal is known to have been through fly or in contact with fly-struck animals, is in poor condition, with perhaps a history of wasting—if this animal has pale, jaundiced or blotched mucous membranes, has intermittent or remittent fever, and yet eats and excretes normally, then it probably is fly-struck.

The conditions with which the disease is most likely to be confused are the debilities due to over-work, under-feeding or worm infestation. These, however, all present some symptoms which are absent in tsetse fly disease as described above.

Prognosis.—When true symptoms of the disease appear in a naturally infected animal the hope of spontaneous recovery is so small as to be almost negligible. In the absence of treatment one can continue to get work out of an infected animal until it dies, but this course is only permissible within a fly-belt; to work an infected beast alongside clean ones outside a fly-belt is to court disaster. The prospect of curing an infected animal depends partly on the species of animal affected and partly on the species of the infecting trypanosome, and so it can be gauged only by a veterinary surgeon. At the present time dogs do not respond readily to treatment, and it is hardly worth while attempting to treat pigs and small ruminants. Bovines suffer only from the ravages of *T. congolense* and *T. vivax*, and they are favourable subjects for treatment; at least 50 per cent. of fly-struck cattle will benefit by treatment, even if they are not permanently cured. As experiments are still proceeding I hesitate to say that most fly-struck cattle can be cured, but

such is my belief. Equines may be affected with the same parasites as cause disease in bovines, and such cases are curable; but if they be infected with *T. brucei* I know of no system of treatment likely to be successful.

Prevention.—If cattle have to be driven through a fly-belt and the road is wide, one takes advantage of the fact that tsetse will not fly far from the bushes on a dark night. If one has to follow a narrow path, then it is impossible to avoid brushing the flies from their resting places, and so on the darkest night one's animals will be bitten; under such circumstances it is best to try and choose a cold, rainy night with enough moon to prevent stampeding and loss of way. If the belt cannot be traversed during the dark hours, an effort must be made to find an open space, such as a big native garden or a vlei, where the cattle can be close herded during the day-time. Smudge fires along the edges of a small grazing ground can be arranged. If the number of animals be small, then a spray containing ½ lb. of soap and 2 gallons of paraffin to 23 gallons of water should be applied before the belt is entered. Dogs, of course, should be put in fly-proof crates for carriage through a belt. Horses should be rugged, hooded and bandaged, as well as sprayed, and probably their passage is best effected in the day-time, when a boy with a fly-switch can keep close watch.

Outside fly-belts, the disease should be looked upon as an infectious one, and on no condition should fly-struck animals be allowed to mix with healthy ones.

Treatment.—As at present this can only be given by a veterinary surgeon, I shall say very little about it.

The drugs which have been found most useful are orpiment, tryparosan and tartar emetic. The dose of the first for an ox is one drachm, given in the form of an electuary. The dose of tryparosan is two drachms, given sub-cutaneously. The dose of emetic is one gramme, given intravenously. Combination of two or all three of these drugs will resolve all but the most severe infections set up by *T. congolense* or *T. vivax*. Disease due to *T. brucei* is at present incurable. As a routine treatment which has given good results in my hands, I give a course of six intravenous injections of 25 ccs. of a 4 per cent. watery solution of tartar emetic at intervals of five days. At the end of this year I shall be in a position to publish the results which this method of treatment has given when tried on a large scale.

From Breeder to Butcher.

BEEF FEEDING EXPERIMENT No. 6, GOVERNMENT EXPERIMENT FARM, GWEBI.

By Eric A. Nobbs, Ph.D., B.Sc.

The cattle-fattening experiment described below is the outcome of a series of such investigations carried out in recent years at the Government experiment farm, Gwebi. It is described in considerable detail, as a stage has now been reached when a system may be said to have been devised to meet the peculiar conditions of this country, and which it is practicable to follow on most mixed or arable farms where the foodstuffs not only can be grown, but ought to be grown, in rotation or otherwise, in the course of ordinary farming operations. The lines here indicated may be taken as a general guide, adaptations being made as common sense dictates to meet the special circumstance of any particular case. There is still much to be learnt on this subject, which, with grade stock fairly common and several outlets for the finished product, is now within the range of practical farming enterprise.

Lessons of Previous Experiments.—Past experiments at the Government farm, Gwebi, have sufficiently established the following facts under the conditions obtaining there at the present time as regards stock, crops and markets.

1. It is not profitable to fatten artificially the unimproved native cattle of the country; only grade stock are worth feeding, and the higher graded they are the more profitable does the process appear.

2. It is not profitable to stall-feed cattle whilst the veld is abundant; it is better to let the stock graze until about May.

3. Artificial fattening is only feasible between May and February.

4. Complete stalling is preferable to grazing by day and stall-feeding at night.

5. The more quickly the animals are fattened the better; the duration of the fattening process should not exceed five months, and as much less than this period as can be managed.

6. To this end feeding with concentrates is essential, but all the food may be grown on the farm.

7. It only pays under present conditions to convert the cheaper forms of fodder and cheaper grades of grain into beef, as the finished

article has to compete with veld-fed meat, and the markets are not highly discriminating. Such comparatively costly products as cake, teff and linseed are therefore to be avoided, and others such as beans, ground nuts or mangels used as sparingly as is consistent with securing a properly balanced diet.

8. It does not appear advantageous to feed the class of grade stock now generally available till over three years of age. Younger stock is apt to suffer from teething troubles and incline, when forced, to grow in size and frame instead of adding flesh and fat. Possibly high-grade stock of early-maturing breeds may, when such become plentiful, be profitably fattened at an earlier age than the grade now generally met with.

9. The relative advantages have yet to be tested of stall-feeding animals loose in a kraal or tied up individually in cribs, but experience points to the former as the better system.

10. About two tons of well-tramped manure consisting of dung and bedding may be reckoned upon from each beast during the process of fattening.

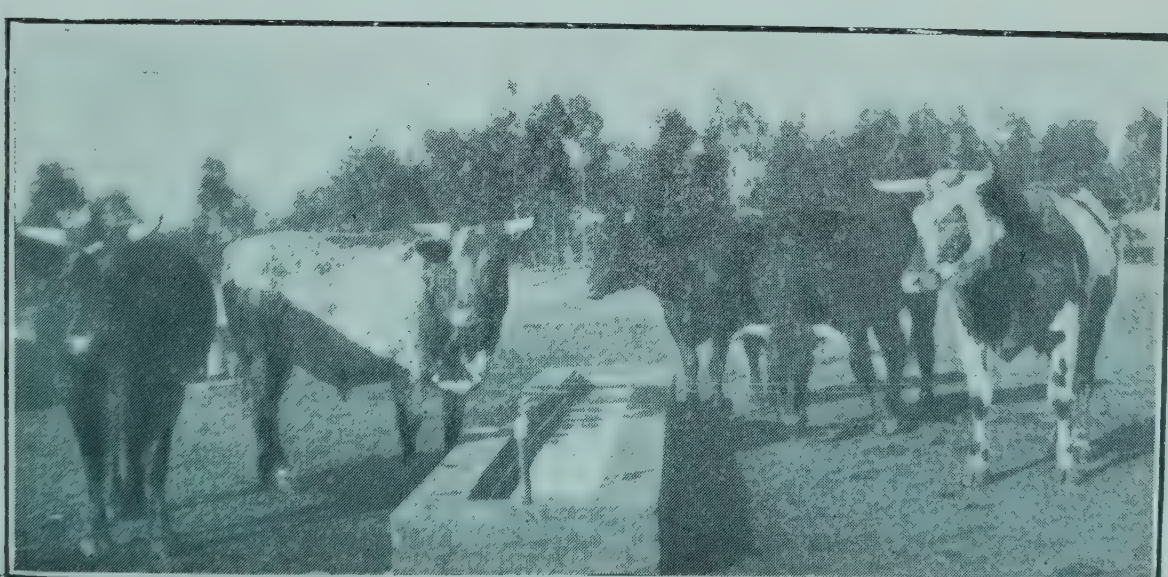
11. To eliminate waste it is advantageous to feed pigs with cattle—one pig to four beasts—but if maize meal is used, not whole maize, then extra feed must be provided for the pigs.

Taking the above points together, it becomes a question between rapid forcing to fatten quickly on the one hand, and the use of the most economical foodstuffs, which entails slower finishing, on the other hand. At the same time, only animals of suitable age to benefit by feeding, and yet not so young as to be wasteful feeders, should be selected. Care should be taken to select individuals of suitable constitution, with a natural predisposition to fatten well, while method, orderliness, cleanliness, quietness and punctuality should be observed in feeding and tending the stock. On the observance of these principles will success in the art of profitable feeding chiefly depend. Regular feeding is essential in fattening cattle.

Food was given punctually each day at 6 a.m., 11 a.m. and 4 p.m. Care was taken not to give more than was consumed at one time. At regular hours the stock were let out to water at a trough close to the pens and left loose. They were not tied up in the pens, a practice for which there appears no need or justification, involving as it does labour in handling each beast and limiting freedom of movement and comfort. This aspect has been fully dealt with in previous reports, and those interested are referred to Bulletin No. 227 (page 14), issued by the Department of Agriculture, Salisbury, for further particulars.

Objects of Experiment.—The principal aim of the experiment under consideration was to fix a scale of rationing and a programme of feeding based on past experience, and adapted to our conditions as regards seasons, foodstuffs available, class of stock obtainable and preparation for markets open to us. A secondary object was to test the relative advantages of three-year and four-year-old cattle of the same description.

Four-year-old Group.



Three-year-old Group.

Four-year-old Group.

Animals Used.—An effort was made to get cattle of the same type and grade and of two distinct ages for comparison. In practice this was not found easy, but the two pens may be regarded as about three and four years old respectively, whilst the quality was very similar, some in each pen being better and others worse, though all might be described as superior grade oxen selected as likely to fatten well. They varied somewhat in character and condition and in dentition. They were such stock as are likely in years to come to be obtained in numbers from ranches for the purpose of fattening on arable farms, and so were useful for a practical experiment in feeding and fattening.

The cattle used in this experiment consisted of ten head of grade oxen, sired by Shorthorns out of good cows, and were calved in 1914 and 1915. They came from the Rhodes Inyanga Estate, where they had been reared under ranching conditions, not kraaled at night. Consequently they were somewhat wild and unaccustomed to handling.

Course of the Experiment.—During the first fortnight after arrival at the Government farm the cattle grazed in a paddock, and were weighed three times and found to vary but little. They gave great trouble during the process, but were put on to the scale regularly every week throughout the progress of the experiment and ultimately became accustomed to it.

During the first day in the pen the stock were unsettled and would not eat any of the food put before them, to which they were entirely strange, having hitherto grazed all their lives. On the second day two animals only began to eat the maize meal and the field radish, and on the third day the rest followed suit, except one which was always very shy and only began to eat on the fifth day. As a result, there was a heavy loss in weight during the first week, amounting to 4 per cent., which was only made up during the second week, by which time they had settled down and were thriving nicely. If the increase of weight were to be calculated from the end of the first week the gains would obviously be more than if the original weight is taken as a basis. A more gradual transition from the veld to the fattening pen would have been better.

In practice it is probable that some advantage might be derived from putting the cattle, when first received from the ranches, on to maize stalks or stubble lands for about a month and kraaling them at night in the pens in which later they are to be fattened, thus accustoming them to artificial food and to their pens, and avoiding the loss of weight recorded above in the first week of the experiment. They had to learn to eat artificial food in a manger and had to get accustomed to their new surroundings. It would have been better to have brought them into the pens each night during the preliminary fortnight and gradually to have kept them there later, bringing them in earlier each day until finally they remained in altogether. This leeway was fully made up the next week by gains of 330 lbs. and 198 lbs. respectively, leaving the animals at about the original weights but in a rapidly thriving and advancing state.

Once started the animals ate with avidity the food given them, which consisted of sufficient variety to keep them in health as well as to

increase their weight. Towards the end of the first period, which lasted eight weeks, the beasts appeared to loose their appetites and were less inclined to eat silage, but with the changed ration recovered their desire for food. After a month on the new scale they again refused the silage, and as there was no object in forcing them to take it, which would have involved the risk of a check in their progress, it was discontinued, though occasionally they were given a little to try them, but without success. The second or fattening stage lasted six weeks, the transition from one stage to another being gradual. They responded again to the change introduced in the third or finishing stage, when the most attractive food available was placed before them, and they fed well and became very quiet, sleeping a great deal. The oily nature of ground nuts had a somewhat laxative tendency at first, but they soon became accustomed to it as well as to crushed sunflowers, which appeared to be the food most relished of any at this time, when they were inclined to be fastidious in their eating and had to be coaxed to consume the feed, which was the maximum they could be induced to accept.

Rations.—A standard diet based on theoretical considerations was arranged before the experiment actually commenced, in which three stages were laid down in accordance with past experience and to utilise the foodstuffs obtainable on the farm, nothing being bought except salt. This menu was intended only as a general guide and was adhered to, but the stockman used discretion, and observing the animals closely, from time to time changed the feed as they shewed a distaste for any one food or a willingness to eat more of another. In this way their interest in their diet was maintained, a very important matter in fattening cattle. The pre-arranged diet, however, had been framed to suit both the physiological requirements and the palate of the animals, and was only departed from to a slight extent. The amount of the feed was altered from time to time according to the gain in weight, being always calculated in proportion to 1,000 pounds live weight.

The rations devised have been found approximately correct, but in view of experience gained slight modifications will be made in future feeding operations. As a rule of thumb guide it is approximately correct to say that equal quantities of maize or other grains and of mangels, pumpkins and other such succulents may be given and double these quantities of hay and silage. For practical purposes a fair ration for the first period would, therefore, consist of 9 pounds maize, 9 pounds radish, mangolds, pumpkin or majorda, with 18 pounds of hay and 18 pounds of silage, a total of 54 pounds per 1,000 pounds live weight. This is our local experience, and it varies a little from standards elsewhere, but is founded on the crops that are available to us.

In the next stage it will be noticed that maize is replaced to the extent of about one pound each by ground nut and dhal bean meal to raise the albuminoid ratio, which is also secured by feeding velvet bean hay in addition to ordinary hay. Drier food is required and silage and succulents are both reduced. Thus for the second or fattening period the diet would be per 1,000 pounds live weight, 7.5 pounds maize, 1 pound ground nut meal, 1 pound dhal meal, 7.5 pounds of succulents, 10 pounds of velvet bean hay, and say 15 pounds each of silage and veld

hay, though these are always fed *ad libitum.* For the finishing stage maize is reduced and replaced by the other meals, sunflower being introduced as a palatable and wholesome variant; succulents remain the same, velvet bean hay is increased to 15 pounds, veld hay remains the same, and silage falls out altogether. The actual ration as given, and as found by experience desirable, differed only slightly from the standard. What had really been consumed could only be ascertained at the end of each period. This is shewn in the following tables:—

PERIOD I.

	Albuminoid Ratio.	Maize.	Veld Hay *ad lib.*	Silage *ad lib.*	Field Radish.	Majorda.
Theoretical Ration in pounds	1:9·1	10	20	30	5	5
Actual Ration, 3 year olds	1:9 6	8·9	17·8	17·2	8·6	
Actual Ration, 4 year olds	1:9·8	8·7	16·1	16·3	8·2	

Field radish is eagerly eaten, and as the cattle had to be taught to eat such foods this was given in preference to majordas; therefore, the diet fed should be compared to 10, not 5. Moreover, field radish is not a good keeper and had to be consumed quickly, whilst the kaffir melon could wait till later in the season. Veld hay and silage were also given *ad libitum,* and latterly more was being eaten than at first, and really just about the standard shewn was a day's feed. In practice the aim must be to fatten stock with as little of the more costly foods as possible, and the maize used was slightly less than anticipated.

PERIOD II.

	Albuminoid Ratio.	Maize.	Veld Hay *ad lib.*	Silage.	Velvet Bean Hay.	Pumpkin.	Mangel.	Dhal Meal.	Ground Nut Meal.
Theoretical Ration in pounds	1:6·3	8	10	40	10	5	5	1	1
Actual Ration, 3 year olds ...	1:7·8	7·5	17·5	14·5	10	—	6·4	·87	·87
Actual Ration, 4 year olds ...	1:7·9	7·3	15·7	13·1	9	—	6·2	·8	·8

The actual ration agrees closely with the standard, but rather less grain, silage and succulents and more hay were used.

PERIOD III.

	Albuminoid Ratio.	Maize.	Veld Hay *ad lib.*	Velvet Bean Hay.	Mangel.	Dhal Meal.	Ground Nut Meal.	Sunflower Meal.
Theoretical Ration in pounds... ...	1:5·4	6	10	15	10	2	2	1
Actual Ration, 3 year olds	1:5 5	5·9	16·5	16·5	6 6	2	2	1
Actual Ration, 4 year olds	1:5·2	5·9	15	15	7	2	2	1

More appetising food was used in the last stages of fattening to tempt jaded appetites; the animals preferred dry food to succulents, hence the oil of the ground nuts and sunflower meal proved a useful corrective.

The following table shews the consumption and distribution of food during the three feeding periods and the total amount used, which should be useful to anyone desiring to fatten cattle on similar lines.

CONSUMPTION OF FOOD IN POUNDS.

	Maize.	Veld Hay.	Velvet Bean Hay.	Silage.	Mangel.	Field Radish.	Majorda.	Dhal Meal.	Ground Nut Meal.	Sunflower Meal.
3 Year Group—										
Period I	2,908	5,830	—	5,630	—	2,120	700	—	—	—
Period II ...	1,820	4,200	2,400	3,500	1,540	—	—	210	210	—
Period III ...	1,012	2,800	2,800	—	1,120	—	—	340	340	170
Total	5,740	12,830	5,200	9,136	2,660	2,120	700	550	550	170
4 Year Group—										
Period I	3,165	5,850	—	5,900	—	2,290	700	—	—	—
Period II ...	1,960	4,200	2,400	3,500	1,680	—	—	210	210	—
Period III ...	1,116	2,800	2,800	—	1,260	—	—	369	369	185
Total	6,241	12,850	5,200	9,400	2,940	2,290	700	579	579	185
Total for 10 Head...	11,981	25,680	10,400	18,536	5,600	4,410	1,400	1,129	1,129	355

Taking the total food consumed by the ten animals throughout the period, we find that the feed required per pound of gain in weight was: 4.5 pounds maize meal, 9.6 pounds veld hay, 3.9 pounds velvet bean hay, 7 pounds silage, 2.1 pounds mangel, 1.6 pounds field radish, .5 pound majordas, .4 pound dhal meal, .4 pound ground nut meal, .13 pound sunflower meal.

Maize in the fattening diet occupies the place taken by oil-cake in other countries as the basis of the concentrated food, but is supplemented by other foods containing a higher albuminoid content, beans, ground nut and sunflower. The maize for cattle on the farm need obviously not be of the same quality as that intended for human consumption and export. In this experiment rather less than six bags per beast were consumed. From this figure and knowing his stock of offal and inferior grain, excluding of course positively uneatable stuff, the farmer can readily calculate how many head of cattle he can put up to fatten each winter.

Field Radish was preferred to any other food, even mangold or maize, and much preferred to majorda. This was noticed in all stock on farm, and this useful crop, it may in passing be observed, deserves more attention than so far it has received in Rhodesia. It, however, can only be fed early in the season, say from mid June to the end of July, as it will not keep.

Mangold is the most useful, being nutritious, palatable, and the best keeper amongst this class of food.

Pumpkin is relished, and ranks next to mangold.

Majorda was eaten, but was not very much relished, it being left till all other feed in the trough was finished. None the less it is a useful succulent foodstuff if field radish, pumpkin or mangel is not to be had.

Dhal crushed into meal and mixed with maize was very beneficial, and is apparently palatable as well as nutritious. The cattle preferred dhal to Canadian Wonder beans or haricots, neither of which they seemed to care for, and as these command a good price for human consumption, they may be dispensed with. Dhal meal overcame the difficulty we had to get a leguminous grain food, and in these experiments proved most useful and beneficial.

Velvet Bean Hay was eaten with great relish when the stock had ceased to care for other fodder.

Ground Nuts in meal or in the pod and with the tops or vines attached were excellent. In this instance they were given as meal and proved most useful in the final stages.

Sunflower is another feed of the highest value, of which more might perhaps with advantage have been given. Animals must be gradually accustomed to oily foods, which in moderation are a most useful class of feed.

Maize Silage was much preferred to Napier silage, but latterly the oxen entirely refused this class of diet.

The table below shews for each animal, and also as averages for each group, the initial live weight, the gain and the final live weights taken before the animals left the farm and at Johannesburg; also the dressed weight of the carcase and the percentage of dead weight to live weight.

INDIVIDUAL LIVE WEIGHTS AND SLAUGHTER RECORDS.

Cattle Nos.	Initial Live Weight. 24-4-19	Gain in 133 days	Final Live Weights.		Dressed Weight	Percentage Dressing on	
			Gwebi 3-9-19	Johannesburg 12-9-19		Gwebi Weight.	Johannesburg Weight.
3 Year Group:							
9	952	223	1,175	1,111	620	53·0	55·8
1	903	273	1,176	1,111	635	54·0	57·1
2	1,000	275	1,275	1,205	690	54·1	57·2
4	972	308	1,280	1,209	730	57·0	60·3
3	1,020	290	1,310	1,238	755	57·6	61·0
Average of Group ...	970	274	1,243	1,175	686	55·1	58·3
4 Year Group:							
10	1,082	200	1,282	1,210	740	57·7	61·1
5	1,055	256	1,311	1,238	780	59·5	62·2
6	1,136	342	1,478	1,395	841	56·9	60·2
7	1,053	282	1,335	1,261	784	58·7	62·1
8	1,152	206	1,358	1,282	785	57·8	61·2
Average of Group ...	1,097	257	1,353	1,277	786	58·1	61·3
Totals ...	10,325	2,655	12,980	12,260	7,360	56·6	59·8

The Johannesburg live weights were calculated on the average loss on the total weights of 5.5 per cent. on the journey, and the percentage dressed weight ascertained accordingly.

The figures for the two lots are seen to be very similar. The total direct increase in weight on the ten beasts was from 10,325 to 12,980 pounds, or 2,655 pounds net; the average daily increase being just about

2 pounds per head. The older animals, however, dressed on the average better than the younger lot by 3 per cent. The rate of increase was greatest in the first period, when the animals were lean, and least in the final period, when it is more difficult and costly to add flesh and fat as the animal approaches perfect maturity. The three-year-old animals added just 28 per cent. to their original weight, and the four-year-olds 23 per cent. The feeding process did not only add direct weight, but also converted the original animal from a value of 15s. 6d. per 100 pounds live weight, taken at the original value of £8 per head, to a greater weight of a value of 27s. per 100 pounds live weight, taking the actual price obtained in Rhodesia of £17 10s. per head, not the Johannesburg price, which was even higher. In Johannesburg the price realised was 60s. per 100 pounds dead weight, equivalent to 36s. per 100 pounds live weight, from which cost of railage, commission and charges would have to be deducted before comparison is made with the above figures. The increase at the end of the period is shewn in the subjoined table:—

	3 year group of 5 head in lbs.		4 year group of 5 head in lbs.	
		Increase.		Increase.
Original weight	4,847	—	5,478	—
At end of period I. (9th week) ...	5,525	678	6,062	584
At end of period II. (15th week)	5,898	373	6,615	553
At end of period III. (19th week)	6,216	318	6,764	149
		1,369		1,286

Loss en Route.—On arrival at Johannesburg, after a whole week in the truck owing to hot boxes, instead of four days, the animals weighed 12,260 pounds against 12,980 on the farm, a loss of 720 pounds, or 5.5 per cent., or 72 pounds on each beast live weight. Butchers examining the carcases stated that this loss would have been much heavier in the case of grass-fed animals. On the other hand no doubt the wastage would have been less had the journey been of normal duration, for owing apparently to rough shunting certain of the carcases when flayed had to be condemned as unfit for human consumption. This was an accidental circumstance, and though much to be regretted, in no way affects the main issue of the experiment.

Costs.—As to the financial aspect of this and kindred experiments almost anything can be proved according to the valuation placed upon the foodstuffs and charges for supervision. If top market prices are reckoned for foodstuffs it can be made to appear that there is little or no profit, or even a loss. In practice oxen are used to convert crops not readily saleable in other form into beef, and the process must be regarded as one whole commercial venture without taking profits out until the end. In utilising the roughage, a certain amount of maize, beans, ground nuts or other such concentrates are required, but as a rule this need by no means be first grade or top quality so long as it is sound, and in converting it into meat much of the incidental cost of bagging, carting, railage and commission is saved. Offal grain may be quite wholesome feed and yet be of no marketable value whatever.

The actual food consumed is shewn in the tables, from which anyone interested can work out what the cost under any particular set of conditions may be. The details are as follows :—

Maize, 11,981 pounds, say 59 bags.
Veld hay, 25,680 pounds, say 12.5 tons.
Velvet bean hay, 10,400 pounds, say 5.2 tons.
Dhal, 1,129 pounds, say 6 bags.
Ground nuts, 1,129 pounds, say 10 bags.
Sunflower, 355 pounds, say 3 bags.
Mangel, 5,600 pounds, say 3 tons.
Field radish, 4,410 pounds, say 2.5 tons.
Pumpkin,
Majorda, 1,400 pounds, say .75 ton.
Silage, 18,536 pounds, say 9 tons.

Allow 22 tons of good dung.

Use of pens, labour and supervision may also be charged for in any calculation of costs.

Butchers' Reports.—The buyers have kindly furnished particulars from their point of view. Owing to the fact that unfortunately the animals were weighed at Johannesburg in pairs, and not individually as should have been done, the percentage for each individual animal cannot be given with absolute certainty, but deducting the loss *en route* of 5.5 per cent. from the known weight at Gwebi, we arrive at figures for the live weight at Johannesburg, and the percentage dressed weight. Compared to the weights at the farm of course the percentage of dressed weight is slightly lower than the Johannesburg figure, as the live weight there was less by 720 pounds' loss. The three-year-olds' average dead weight at Johannesburg compared to live weight at Gwebi is 55.15, whilst that for the four-year-old pen is 58.1, shewing an advantage in dealing with the older animals; or 58.3 and 61.3 of Johannesburg live weights.

The buyers reported that in spite of the journey taking three days longer than usual, and lasting a whole week, the animals looked well on arrival and realised top market price of 60s. per 100 pounds dead weight, and killed 60 per cent. of the starved live weight, which was higher than most of the oxen sent to Johannesburg Fat Stock Show and being killed at the same time.

The buyer preferred this meat to some of that from the show stock, which was over-loaded with fat, whereas in these animals there was an even general covering, indicating a finished prime carcase quite fit for the best local or overseas trade. The quality of the beef was described as not to be surpassed for export and of a type always certain to command the top market price. Dressed weights ranging from 620 to 841 and averaging 772 pounds are most suitable for the butcher and exporter alike.

Butchers and dealers consulted at the commencement of the experiment expressed the live weight value for store cattle at 16s. per 100, equivalent to about 35s. dead weight, and the corresponding values of prime animals at 25s. per 100, or about 45s. dead weight.

Assuming these figures to be correct—and they are ordinary commercial prices locally obtained—then as nearly as possible it may be said that the feeder converts the original weight of the animals he purchases from a value of 16s. to 25s. per 100 pounds, that is to say, 9s. in value is added to the original weights, whilst each beast puts on an additional weight of about 300 pounds, of a value of 25s. per 100 pounds live weight.

He buys 1,000 pounds live weight at 16s. per 100 equals £8, and sells 1,300 pounds live weight at 25s. per 100 equals £16 5s.

In this connection it is interesting to observe that in the preliminary forecast the figure of 15s. 6d. was correctly taken, but the anticipated price was forecasted at from 23s. 6d. to 24s. 9d. per 100 pounds live weight for a carcase dressing 55 per cent., whereas actually a better finished article was produced, scaling 60 per cent. and commanding 36s. per 100 live weight at Johannesburg.

Another way of expressing the result of the commercial feeding of cattle is to say that by ranching we produce in four years a beast worth £8, and by feeding in four months we add as much again to his value, whilst by sending to Johannesburg a really prime fat animal we can add yet a further £8 to his gross value. The actual figures will vary with the breeding and type of animal, with his condition when brought in to fatten and his degree of perfection when finished, also with the prices current at date of sale, but the above statement is a fair example, as shewn by actual experience, in the case of grade Shorthorns in moderate condition carefully fed and sold as prime finished oxen. Whether this pays depends chiefly on the cost of the foodstuffs supplied.

Resume.—The duration of the experiment was 19 weeks or 133 days, and the net result was that in that time animals appraised by independent valuers at £8 a head were converted into fat stock which fetched £17 10s. on the farm sold to a dealer who actually sold them in Johannesburg at over £25 each, making a profit in doing so.

The importance of these experiments, which have been in progress some years, is not to be overlooked. Step by step methods of feeding have been tried and compared, and a system arrived at which is practicable and profitable. The results are so striking that it is hoped next year to repeat, with improvements from lessons learnt, the experiment on a much larger scale, and probably to send fat carcases to London so as to ascertain the actual charges and profits to be made in every step from the breeder to the ultimate retailer.

An experiment of the nature of that described above involves much more labour and careful attention to detail than does the ordinary care of stock. Every ration has to be weighed, every week each beast has to be weighed, careful records have to be kept and the diet changed from time to time with increase of weight as well as according to the stage of fattening reached and the indications given by the animals.

For the conduct of the experiment Mr. A. Wynn of the Government experiment farm was responsible, and acknowledgment is due to him for the zealous and accurate manner in which he carried out his duties.

Rotation Experiments, 1913-1919.

By H. G. Mundy, F.L.S., Agriculturist and Botanist, and
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In the year 1913-14 were planned and commenced, on the agricultural experiment station, Salisbury, a series of crop and rotation experiments which, having now been in progress for five years, may with advantage be written up and the results thereof brought to the notice of the farming community. These experiments have been referred to but very briefly in previous *Agricultural Journals*, and the results now published must by no means be regarded as final. To be conclusive, rotation experiments must extend over a much longer period, and subsequent results may render necessary some reconsideration of views here expressed. It is thought, however, that the information now available cannot be other than helpful, and that farmers may perhaps be able to adopt some of the suggested lines of cropping in a modified form to meet their own particular scheme of farm management. In formulating these experiments it was realised that Rhodesian farmers were handicapped in their desire to maintain soil fertility by the following facts:—

(a) By maize being the only staple crop which could be produced profitably on an unlimited scale, and which must therefore each year occupy the greater proportion of the arable land.

(b) By a system of stock farming which does not lend itself to the production of large supplies of farmyard manure or to manure of high quality.

(c) By the high price of artificial fertilisers.

The experiments were devised in order to determine four important points concerning the relation of soil to crops grown upon it, and incidentally to test the effect on soil fertility of some form of rotation, conceived on the lines of those in general use in the Old World, but adapted to the limitations imposed by the much smaller range of crops which could be sold or economically utilised on the farm. The index crop adopted was naturally maize—the staple cereal crop of the country. The four points to be determined were:—

(a) The effect of continuous maize cropping on the average red soil of Mashonaland without the application of manures.

(b) The amelioration, if any, effected by alternate maize and bare fallow and the extent to which such fallowing maintains fertility unassisted by the application of manures.

(c) The result on the maize yield and general fertility of the soil

of introducing a three-course rotation consisting of maize, a white straw crop and a legume; all crops being taken off the land and no manure being returned to it.

(d) The effect of the addition of a manured root crop to the above rotation, making it a four-course rotation, with kraal manure at the rate of 6 to 8 tons per acre applied to the root crop; the index crop not being grown until the third year after the application of manure.

The following explanation is necessary in order to appreciate the choice of crops used in the rotations: Local experience has amply demonstrated that throughout the Rhodesian maize belt continual cropping to maize exhausts the soil of humus (since usually very little of the crop is returned to the land), and this in a few years renders it lumpy and difficult to work until good rains have fallen over it. This condition is probably further accentuated by the cultivation given to the crop, which often tends to pack the soil, and by the beating down of the soil by heavy rain. Such conditions are less noticeable on land sown to fine strawed crops such as wheat, oats, manna, teff grass and Sudan grass, which cover the ground more completely than does maize, and which leave a stubble to be ploughed under, thus in some degree returning organic matter to the soil. The improved condition in which land, cropped for several years to maize and then put down to a fine strawed crop, ploughs up is generally recognised. Most of such crops are, however, not readily saleable, but since there appeared reasonable prospects of growing a summer wheat the resultant crop of which would always be saleable, wheat was given the place of the fine strawed crop in the rotation. There seems no reason why any other similar crop should not have been substituted without materially affecting the results.

A deep-rooted nitrogen-gathering legume was the next consideration, the choice of proved crops lying between ground nuts, kaffir beans or cowpeas and velvet beans. The latter, though not usually producing root nodules in great abundance, was a more certain crop than cowpeas and easier to handle than the kaffir bean. The market for ground nuts was in 1913 uncertain, and, moreover, with this crop the greater proportion of the nodule-bearing roots is removed from the soil in harvesting, whereas with velvet beans grown for hay, the entire root system is left in the ground. Velvet beans can always be economically utilised on the farm either as hay or as hay and bean crop combined; or if desired, they can be ploughed under for green manure. Velvet beans were therefore selected as the legume.

A deep-rooted crop to which kraal manure could profitably be applied was next required, and the mangold was chosen, since it was felt that as stock improvement and stall feeding progressed the need of mangolds would in time become apparent. Turnips and swedes were discarded as unreliable crops, but perhaps potatoes or sweet potatoes, though surface feeders, might in whole or part have replaced mangolds on the manured land. It is in any case desirable that the crop to which kraal manure is applied should to some extent be a hoed crop, otherwise the weed seeds contained in the manure will cause trouble.

It will be noticed that of the crops selected, two, namely, velvet beans and mangold, are tap-rooted plants which draw largely upon the sub-

soil for their food supplies, and bring these supplies to the surface soil. Maize is regarded chiefly as a surface feeder, while, though winter wheat is generally considered a fairly deep feeder, the very quick maturing summer variety, Yellow Cross, used in these trials, and which only occupies the ground for 12 to 14 weeks, does not develop a deep root system, and may also be regarded largely as a surface feeder. In the three-course rotation there are therefore two surface feeders and one deep feeding legume, and in the four-course, two surface feeders and two deep feeders, one of which again is a legume.

In considering the yield of maize grown continuously on the same land for a number of years without the application of manure, one must remember that graminaceous crops are less exacting in their demands upon the soil than many other crops, and will for a considerable time continue to yield a moderate, though not necessarily a profitable, return upon exhausted unmanured land.

Existing methods of maize growing do not usually provide for any great return of vegetable matter to the soil, and much less is returned than would be the case were wheat the staple crop. Failure to return vegetable matter to the land results in the depletion of humus, and an adequate supply of humus is of three-fold importance, since—

(a) it augments the water-holding capacity of the land;

(b) it encourages the activity of beneficial soil organisms and itself supplies plant food;

(c) it betters the texture of the soil and renders it more easy to work.

The reasons for the choice of crops used in the two rotations will now be better understood and must throughout be borne in mind. Further reference will be made to this subsequently, but meanwhile it may be emphasised that, on the three-course shift, wheat was included largely for the sake of its stubble; this and the roots of the bean crop were the only form in which organic matter was returned to the soil, while the same may be said of the four-course, except for the augmentation of dung.

The land on which these trials were conducted was broken up about March, 1912, and was under summer wheat during the crop season of 1912-13, the experiments under discussion being commenced in 1913-14. The mangold and velvet bean crops were unfortunately not always weighed. Yields did not vary greatly and in several seasons the acre returns were only estimated. The average yield of velvet bean hay was estimated at about 1 ton per acre, while the mangold crop averaged about 10 tons per acre, 15 tons being the highest weighed yield, and 5 tons the lowest.

The rainfall for the years under review was as follows:—

1914-15.	1915-16.	1916-17.	1917-18.	1918-19.
34.02 ins.	22.34 ins.	32.23 ins.	40.76 ins.	36.46 ins.

The year 1916-17 was remarkable for the fact that during the months January to March a total of only 7.63 inches of rain fell against an average fall for these three months of about 15 to 18 inches. In 1917-18 during the same period 24.83 inches were registered, again unfavourable.

but this time owing to excessive rain and lack of sunshine. The past season of 1918-19, with a total fall of 36½ inches, 20 of which fell between January and March, appears to have been an optimum season for these red lands as is reflected in the fine yields obtained throughout the plots.

In the case of the alternate maize and fallow and of the three- and four-course rotations, the entire sequence of cropping was represented each year, that is to say, the land devoted to each experiment was divided into two, three and four plots respectively and was cropped as shewn below.

TABLE I.

THREE-COURSE ROTATION.

	1913-14	1914-15	1915-16	1916-17	1917-18
Plot A	Wheat	Maize	Bean	Wheat	Maize
Plot B	Bean	Wheat	Maize	Bean	Wheat
Plot C	Maize	Bean	Wheat	Maize	Bean

FOUR-COURSE ROTATION.

	1913-14	1914-15	1915-16	1916-17	1917-18
Plot A	Maize	Mangold (manured)	Wheat	Bean	Maize
Plot B	Bean	Maize	Mangold (manured)	Wheat	Bean
Plot C	Wheat	Bean	Maize	Mangold (manured)	Wheat
Plot D	Mangold (manured)	Wheat	Bean	Maize	Mangold (manured)

The results may therefore reasonably be accepted as accurate, though owing to the small extent of the station and the good stands obtained, the relative yields are higher than are generally obtained on a large farm. No special attention or cultivation was given to any of the plots except such as is commonly practised on all well-worked farms in Rhodesia, and each year after 1915-16 the advantage of the rotation systems, later reflected in the yields, was clearly in evidence during the growing season. The following table gives the acre yields of maize in bags of 200 lbs. weight and of wheat in pounds.

TABLE II.

	1914-15	1915-16	1916-17	1917-18	1918-19	Total for	Average for
A. Maize, continuous	9·5	5·8	2·8	2·9	9·9	5 years. 30·9	5 years. 6·18
B. Alternate maize and bare fallow	14·2	9·1	3·5	7·1	17	5 years. 51·2	5 years. 10·25
C. Three-course rotation: Maize ...	...	10	6	11·1	17	4 years. 44·1	4 years. 11·02
Bean ...	Estimated yield, 1 ton of hay per acre per annum						
Wheat ...	...	310	310	340	650	1,610	402·5
D. Four-course rotation: Maize ...	...	...	8·4	13·3	18·8	3 years. 40·5	3 years. 13·5
Bean ...	Estimated yield, 1 ton of hay per acre per annum						
Wheat ...	...	...	300	500	500	1,300	433·3
Mangold ...	Estimated yield, 10 tons of roots per acre per annum						

Note.—A. grew maize in 1913-14, but crop was cut for silage; C. first cycle of the rotation not completed until 1915-16; D. first cycle of the rotation not completed until 1916-17.

Assuming, for the sake of comparison, that it usually costs 3 bags, valued at 12s. 6d. per bag, to grow an acre of maize, the maize continuous will in these experiments shew an average profit of approximately 3 bags per acre, valued at £1 17s. 6d. With alternate maize and fallow the profit rises to 7¼ bags, worth £4 10s. 7d. per acre. In the three-course rotation the profit will be 8 bags, worth £5, per acre, and in the four-course, with one crop manured, the profit will be 10½ bags, worth £6 11s. 3d., per acre.

The marked effect of the optimum season 1918-19 is well illustrated by the increased yields throughout all the plots, while the unfavourable

Note.—*The reliability of these results is confirmed by those obtained in a seventeen-year series of experiments carried out in Missouri, U.S.A., where maize grown continuously on the same land for seventeen years without manure yielded an average of 3 bags per acre. Grown in a three-course rotation of maize, wheat, clover, still without manure, the yield rose to* 12.75 *bags per acre, and where farmyard manure was applied to one of the three crops in the rotation the average yield increased to* 19½ *bags per acre.*

weather conditions of 1916-17 and 1917-18 are reflected in the uniformly reduced yields. Under continuous maize the land consistently returns less than when under alternate maize and bare fallow, and in unfavourable seasons drops perilously near to crop failure. It is not unreasonable to assume that this decrease is due, at least in part, to depletion of humus in the soil, since with the fallow a certain amount of weed growth is always turned in.

On comparing alternate maize and fallow with maize in a three-course rotation, it will be seen that with the latter, where more vegetable matter is returned to the soil, part of it derived from a legume, still further crop increases are consistently obtained, while where kraal manure is added once in the course of the four-year rotation, higher yields still, as might be expected, are invariably registered.

An inference which it seems not unreasonable to draw is that even under continuous maize cropping for seven years good average red dioritic soils such as this are not actually exhausted in fertility, but the plant food still remaining is not in easily available form, and, except in very favourable seasons, cannot be made use of to advantage by the maize plant or probably by any other surface feeding crop. When, however, a judicious change of crop, including a deep rooted legume, is made sufficiently often, remunerative yields seem likely to be obtainable for several years longer, even without the application of manure or fertilisers. In this respect these experiments only confirm what might be expected, and it was largely with the object of proving this point that they were undertaken.

The deductions which we may now not unfairly draw are:—

(a) That even on virgin red land or land in good heart, maize should not be grown continuously for more than three to four years, since if this is attempted the yield will steadily fall, and at any time after the third year an unfavourable season is liable to cause practical crop failure. Continuous cropping for longer periods may only be profitable given a sequence of optimum seasons, which is more than can reasonably be expected.

(b) That a bare fallow every alternate year—a certain amount of weed being turned under—does much to maintain fertility, though this alone will not adequately replace the losses of organic matter, and for other reasons is not economically sound.

(c) That by adopting a three-course rotation as outlined, were such profitable, good average maize yields could be secured, at any rate for a considerably longer period, without the use of manures or fertilisers.

(d) That these yields can be enhanced in a four-course rotation, which includes a root crop to which kraal manure is applied.

It may be said that these facts, though not necessarily yet proved in practice, were already recognised in theory, and are not adopted solely on account of our crop limitations. It is claimed for these experiments that they have demonstrated the practical value of such rotations, and in the writers' opinions further deductions of direct value to the Rhodesian farmer may now be made from them. On considering the amounts of the more important plant foods removed from the soil per acre by an average

yield of some of the crops under discussion, we find that they are as follows:—

TABLE III.

	Nitrogen, lbs. per acre.	Phosphates, lbs. per acre.	Potash, lbs. per acre.	Lime, lbs. per acre.
Five bags maize per acre, including stalks	27·5	10·0	20·0	...
Wheat, grain—say 10 bushels...	11·3	4·71	3·1	0·3
Straw	16·0	6 9	19·5	8·2
Total crop	27·3	11·61	22·6	8·5
Mangolds—say 11 tons roots...	49·0	18·2	111·4	7·9
Leaf	25·5	8·25	38 9	13·5
Total crop	74·5	26·45	150·3	21·4
Beans, grain—say 15 bushels...	39·0	11·4	12·1	1·4
Straw	29 0	6 3	42·8	26·3
Total crop	68·0	17·7	54·9	27·7
Potatoes—8,000 tubers per acre	22·0	13·0	45·0	...

It will thus at once be seen that—(1) The mangold and bean crop make much heavier demands on the soil than do any of the others, though it is true that in part they draw these supplies from the lower levels inaccessible to shallower rooted crops.

(2) That the potato crop is less exacting than the mangold crop.

(3) That graminaceous crops, such as maize or wheat, levy less heavy toll on the soil than either mangolds or beans, and that relatively their requirements are not incomparable.

These facts accepted, it then follows that apart from the value of the stubble of the wheat which was ploughed under, thereby supplying organic matter, not unsimilar results might be expected were the three-course rotation amended to maize, bean, maize. Again as the above table shews, beans make large demands on the soil, and only a proportion of this is returned to the land when, as in these experiments, the crop is reaped for hay and only the roots are ploughed under. If the entire bean crop was ploughed under far more plant food and organic matter would be returned to the soil than was done by turning under the wheat stubble and the roots only of the bean crop. Finally, mangolds

are more exacting than potatoes. The latter crop, if taking the place of mangolds in the four-course rotation, would therefore make smaller demands on the soil, and would probably leave more plant food available for the succeeding maize crop. It is true that the potato crop is sold off the farm, whereas velvet beans and mangolds are consumed on it and returned to the land in the form of dung. Our kraal manure, however, suffers such losses from the leaching effects of rain, sun and wind, that very much of its goodness is lost, so that only a small part of the plant food contained in a fed crop is returned to the land in the form of kraal manure.

If these premises are accepted we can, in a three-course rotation of maize, bean, maize, more than make good the loss of organic matter derived from the wheat stubble by ploughing under the entire bean crop, and at the same time we shall be returning to the soil an even larger amount of other plant foods, no small part of which has been drawn from the lower soil levels untapped by the maize or wheat roots.

Similarly in the four-course rotation, by ploughing under the bean crop and by substituting part potatoes and part maize, both manured with kraal manure, in place of the manured mangold crop, supplies of organic matter and plant food should be maintained equally as well as in the four-course rotation shewn in Table II., and equally good if not better returns of maize may therefore be expected from such a practice. Further experiments planned on these lines and to put this to a practical test are being commenced this season. Meanwhile the following rotations suggest themselves for the red soils of the maize belt, and are, it is thought, in conformity with the limitations imposed by our staple crop :—

(a) (1) Maize; (2) velvet bean or other legume ploughed under; (3) maize; or

(b) (1) Maize; (2) maize; (3) velvet beans ploughed under, or as an alternative part velvet beans ploughed under and part maize, potato or root crop manured with six to eight tons dung per acre; (4) maize.

Such rotations are by no means ideal, the staple crop occurring too frequently, but they should shew a marked improvement over maize continuous. Ploughing under of green manure crops every fourth year may lead to excess of soil acidity, and experiments are in hand to test this. It can always be counteracted by applications of lime. If a dressing of artificial fertiliser can be given to one of the maize crops—the second in the four-course rotation—so much the better. In any case working on the above system two-thirds to three-quarters of the arable land can each year be planted to maize with a good prospect of maintaining the fertility of our soils until such time as more intensive farming becomes the general practice.

Tobacco Culture.

HARVESTING AND CURING.

By H. W. TAYLOR, B. Agr., Tobacco and Cotton Expert.

Harvesting and curing are the two most critical operations in tobacco production. Mistakes in either operation cannot be rectified and may mean serious financial loss to the grower. Successful curing depends on a number of factors, of which one of the most important is the stage of ripeness of the leaf when harvested. Unless the leaf is properly ripe it is next to impossible to cure tobacco a satisfactory colour. If harvested before the proper time, the leaf retains the green colour after it is cured, and if harvested too late, the over-ripe leaf is uneven in colour, brittle and lacking in elasticity and fineness.

The stage at which tobacco should be harvested depends to some extent on the method of curing. If the tobacco is to be air cured or sun cured, the leaf should be harvested just before it is thoroughly ripe. For flue curing and fire curing the tobacco should be fully ripe.

RIPENING.

The young growing tobacco plant has a deep green colour, and the leaves are soft and pliable. This intense green colour indicates that the leaf is rich in nitrogenous constituents, which go to make up the living or vital parts of the leaf, and which are active in building up the food supply of the plant. Garner* states that "at about the time the leaves of the plant as a whole have reached their maximum power of elaborating the food supply the flower head begins to develop. This food supply, consisting of starch and other similar substances, is carried from the leaf into the seed head to furnish the necessary food for the development of the seed. This accomplished, the leaves have completed their full task, and they now pass into the period of gradual decay. In practice, however, the plant is topped, so that the seeds are not allowed to develop. Making a last effort to reproduce itself, the plant now sends out secondary shoots or suckers, but these too are removed by the grower. Under these circumstances the food built up by the leaves is not carried away to other parts of the plant, but accumulates in the leaves themselves. The result is that both the size and body of the leaf are increased." This accumulation of plant food in the leaf induces ripeness and later decay unless the leaves are removed. The

*Bulletin No. 143, U.S.D.A. Bureau of Plant Industry.

lower and middle leaves should be ripe in about 90 days from the date of transplanting, provided the plants make normal progress.

The principal indication of ripeness is a decided change in colour. As the leaf approaches maturity there is a gradual change of colour from a deep green to a greenish yellow. If the leaf is heavy in texture the yellow may only shew in flecks or spots. Another indication of ripeness is the change in texture of the leaf from being soft and pliable to being rough to the touch and brittle. This is due to the accumulation of starch granules within the leaf cells.

The chief secret in curing tobacco successfully lies in knowing exactly when to harvest the leaves, so that they are neither too ripe nor too green. This can only be learned by experience and keen observation. For flue curing the leaf should take on a greenish yellow colour when fully ripe so that the green colour is reduced to a minimum before the tobacco is placed in the curing barn.

HARVESTING.

There are two methods of harvesting tobacco, known as the whole plant and single leaf methods, and each has its advantages. The former is the more economical method of harvesting tobacco for air curing, sun curing or fire curing, but has the disadvantage in that all of the leaves on the plants are not in the same stage of ripeness. For flue curing the single leaf method is generally used, as it is of the utmost importance that all of the leaf should be in the same stage of ripeness.

In harvesting the whole plant the easiest way is to split the stalk with a tobacco knife to within about 4 inches of the ground. The stalk is then slightly bent away from the operator and severed near the ground by a sloping cut. The plant is then placed astride a tobacco stick, which will carry from six to ten plants. These sticks are placed on a tobacco frame or tobacco trolley (see Fig. 1) and carted to the curing barn or scaffolds in the sun. An ordinary wagon can be used for carting the filled sticks by providing a suitable frame (see Fig. 2).

In Rhodesia most of the Virginia tobacco is flue cured. For this method of curing the single leaf method of harvesting should be used, as successful curing largely depends on having all of the leaf in a barn in the same stage of ripeness. If the tobacco varies in the stage of ripeness all of the leaf will not yellow at the same time, and hence will not be uniform in colour when cured. For flue curing the leaf used for each barn should be of uniform texture for the same reason. Lack of supervision in these details is annually the cause of serious loss to tobacco growers in Southern Rhodesia. In harvesting by the single leaf method the first leaves to be removed are the lower ones and the last the top leaves. Generally the most valuable tobacco is obtained from the bottom and middle leaves. The number of pickings required to harvest a field depends largely on the growth of the plant, but from three to five pickings are usually necessary to obtain the best results.

As the leaves are primed from the plants they are placed carefully in suitable containers and conveyed to the stringing shed. In handling

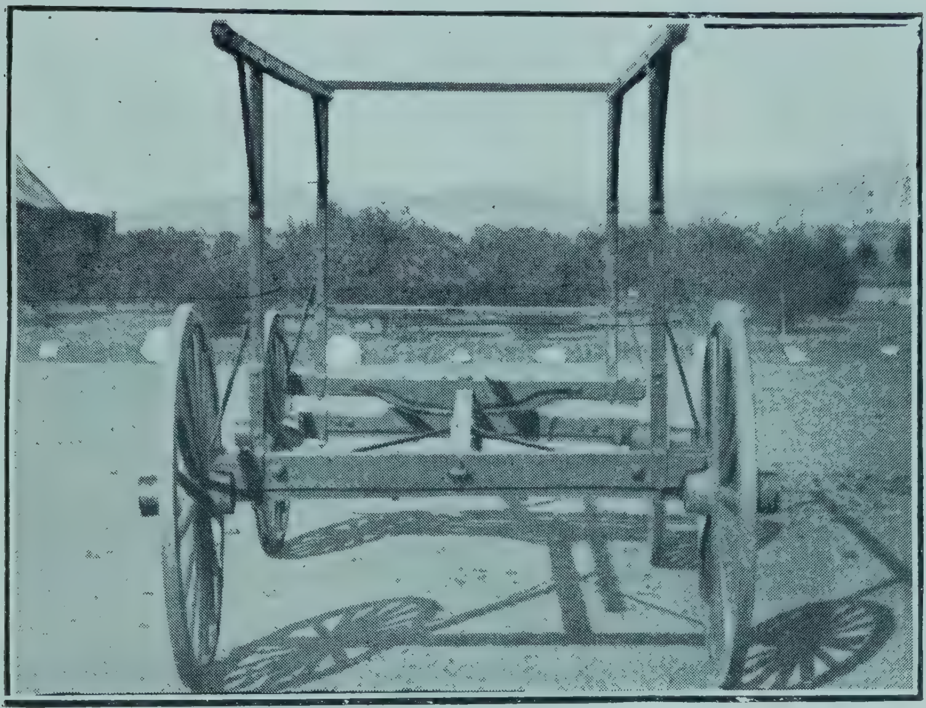


Fig. 1. Trolley for carting sticks filled with tobacco.

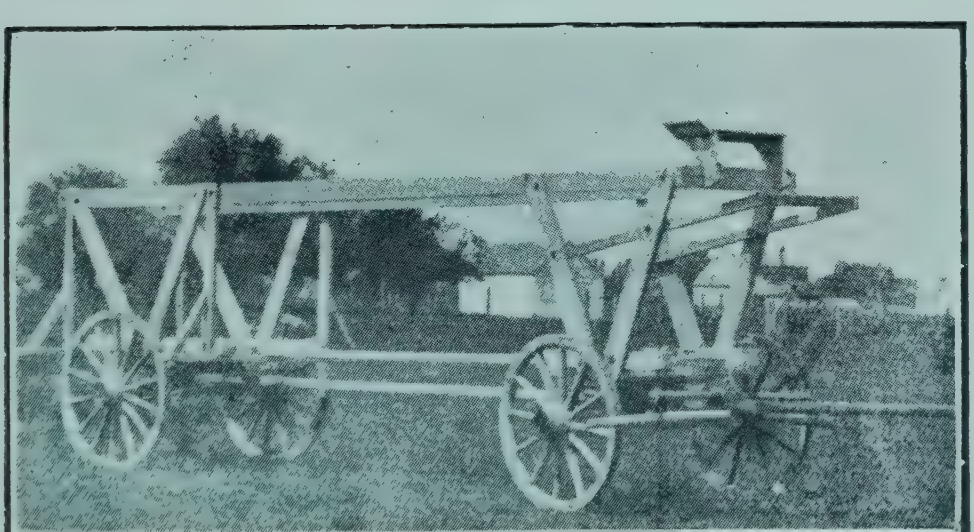


Fig. 2. Ordinary wagon with suitable frame for carting sticks filled with tobacco.

Fig. 3. Air curing shed, Transvaal.

the leaf care should be taken so that no bruising takes place, and on hot days some form of covering should be provided to prevent sun-burn. Both the bruised and sun-burned portions of leaves cure out with a greenish black discoloration which greatly reduces the value of the tobacco. In harvesting the strictest supervision should be exercised in order that all leaves picked may be in the same stage of ripeness and of uniform texture. In the stringing shed the tobacco is placed on tables or in small piles within easy reach of the natives employed in tying. The tobacco is placed in bunches of three to four leaves each and tied with a cotton string which is attached to the tobacco stick. The operation of tying is greatly facilitated by having convenient racks for supporting the sticks and placing the leaves in uniform piles with the butts all in one direction. The operator holds the string in the right hand and receives the bunch of leaves with the left hand. The leaves are placed close to the stick, and the string is wrapped round them, one half inch from the base, one and one-half times, away from the operator, and then turned completely over and across the stick, which operation forms a draw twist. The next bunch of leaves is placed on the opposite side of the stick so that the alternate bunches will balance the filled stick. When the stick is filled the free end of the string is attached to the end of the stick and the tobacco is placed in the curing barn. When properly filled, each stick should hold about 32 bunches of leaves; about 16 bunches on either side.

CURING.

Tobacco when harvested contains from 70 to 80 per cent. of moisture. The most noticeable change which takes place in curing is the gradual reduction of the moisture contained in the leaf. Curing, however, involves more than the drying of tobacco, for if the cells of the leaf are quickly killed by excessive heat or protoplasmic poisons, the product does not possess the properties associated with properly cured tobacco.

During the curing process certain chemical and physiological changes take place which convert or reduce the undesirable constituents of the green leaf into desirable forms found in properly cured tobacco. These changes are gradually brought about during the process of slow starvation to which the leaf is subjected after harvesting. Curing then consists in subjecting the tobacco to a process of gradual starvation under proper conditions.

The principal factors which control the rate of curing are heat and moisture. As there are several methods of curing tobacco, the conditions which are most suitable for one method may not be applicable to another.

Methods of Curing.—The soil and climatic conditions under which the crop is grown and the purpose for which the tobacco is to be used largely determine the method used for curing. The several tobacco-growing countries therefore employ methods of curing to meet their market requirements and individual economic conditions. The diagram given below indicates the several methods of curing and the types of tobacco cured by each method.

Air cured	Cigar tobacco Burley Stemming Transvaal tobacco	Cigars, pipe mixtures, chewing, snuff and cigarettes
Sun cured	Turkish Maryland Virginia Rhodesia	Cigarettes, smoking and chewing
Fire cured	Virginia dark Kentucky dark Tennessee dark	Chewing, smoking, snuff and cheap cigars
Flue cured	Virginia bright Carolina bright Nyasaland bright Rhodesia bright	Cigarettes, pipe mixtures, chewing and snuff

Air Curing.—This method of curing is more generally used than any other, and the greater part of the tobacco produced in the world is air cured. It is also the simplest and easiest method which can be employed, as the usual practice is to place the tobacco in the curing barn, where it remains until thoroughly cured and ready for preparation for market.

Air curing may be described as a natural process of curing, as the tobacco is merely harvested, placed in the barns and allowed to cure by natural atmospheric conditions. If the weather conditions are ideal, good results are obtained, but if wet weather prevails, severe loss may result from "pole sweat." On the other hand, should excessively dry, hot windy weather occur immediately after harvesting, the leaf may be killed prematurely, which greatly reduces the value of the tobacco. In recent years air curing has, in certain tobacco producing areas, been modified by the use of artificial heat and moisture, which enables the growers to regulate curing conditions and thus prevent loss after the crop is harvested.

The conditions most suitable for air curing are clear, calm days, moderately dry atmosphere and a temperature of 80° to 90° F. in the shade. Under these conditions the moisture is absorbed by the atmosphere as fast as it is given off from the leaf, and very little oxidation takes place, excepting in wet weather, so that the leaf cures moderately bright in colour.

Normally all tobacco should take on a yellow colour before it begins to dry. If the tobacco dries out before the yellow colour appears, the leaf will remain green and be of little value. If drying is delayed after the yellow colour appears, oxidation takes place and the colour will change to red or brown. The purpose for which the tobacco is to be used largely determines the proper colour for the cured leaf. For cigarette purposes the leaf should be lemon yellow in colour; for cigars the most desirable colours are shades of brown and olive; for chewing purposes and pipe mixtures a light red colour is most desired. The conditions of curing then should be regulated to produce tobacco most suitable for local market requirements. The time required for air curing varies from six weeks to three months, depending primarily on weather conditions, but also on the size of the tobacco being handled.

In the Union of South Africa the buildings used for air curing (see Fig. 3) are very primitive in construction, but in other countries (see Fig. 4) where this method of curing is practised, the tobacco barns are very costly and elaborate. Cigar tobacco, burley tobacco, the tobacco known as the "stemming type," and most of the tobacco produced in the Union of South Africa, is cured by this method. As these types of tobacco are not grown in Southern Rhodesia, air curing is not recommended as a suitable method for curing Rhodesian grown Virginia tobacco. The reasons why air curing is not recommended are as follows: Firstly, there is very little local demand for air cured tobacco, as the Union of South Africa can produce as much tobacco of this type as can be consumed in South Africa, and the prices in the Union are considerably lower than the prices ruling in this Territory for sun and flue cured tobaccos; secondly, the demand within the British Isles and Australia is not rapidly increasing for this type of tobacco; and, thirdly, the climatic conditions in Rhodesia during the early part of the curing season are not conducive to the best results without the use of costly and elaborate buildings for air curing.

Sun Curing.—Turkish tobacco is sun cured, and this method is also employed in certain parts of America. Sun curing is similar to air curing in that no artificial heat is employed to facilitate curing. The two methods differ in that curing is hastened by exposing the leaf to the direct rays of the sun in the one, whilst in the other the rate of curing is largely regulated by atmospheric conditions.

For sun curing the equipment required consists of a wilting room and packing shed, scaffolds or trellises for exposing the leaf to the sun, and a conditioning cellar for rendering the leaf pliable so that it can be prepared for market. The building described in the October number of the *Rhodesia Agricultural Journal* as a packing shed with conditioning cellar can be used for wilting, storing and conditioning tobacco. The scaffolds or trellises can be made entirely from native timber or with native timber and heavy galvanised wire.

In sun curing the whole plant is usually harvested, but the single leaf method can be used when sun and flue curing are combined. The usual method of sun curing embraces the following operations: The tobacco is harvested just before it is fully ripe and placed on sticks in the wilting room until the leaf takes on a greenish yellow colour. If no wilting room is available the tobacco can be yellowed under grass, but requires careful attention to avoid damage through the leaf becoming too warm and turning black. When the leaf is properly yellowed it is removed to the scaffolds and exposed to the sun until the whole leaf, including the midrib, is thoroughly dry. During this time some form of covering should be provided to protect the tobacco from rain and from dew at nights. For this purpose sail cloth, hessian or grass mats can be used. The coverings are placed in position at night or during showers, and are removed in the early morning or after showers have passed to allow the tobacco to receive the full rays of the sun. When the leaf is thoroughly dry, the tobacco is removed in the early morning to the conditioning cellar, where it remains until the leaf is pliable, when the tobacco is graded and either bulked or baled for marketing. The time

required for sun curing varies from four to six weeks, depending on climatic conditions and the size of the leaf being cured.

Growers who practise sun curing should time their plantings so that the tobacco will be ready for harvesting about the time that the rains normally cease. This will save considerable trouble and expense, besides aiding in the production of better quality tobacco.

Sun cured tobacco of the Virginia type possesses certain desirable qualities as compared with air cured leaf. Leaf cured by this method is usually lighter and more uniform in colour, as well as sweeter and more aromatic. Sun cured tobacco is desirable for chewing and for pipe mixtures.

This method of curing can be recommended for certain areas where only heavy tobacco can be produced, and is especially useful in connection with flue curing. Unless tobacco yellows in the field it is extremely difficult to obtain a satisfactory cure in the flue barn. The leaf which is heavy, oily and unsuitable for flue curing can be sun cured until the web of the leaf is dry and the midrib can then be killed in the flue barn. The combination of the two methods reduces the time required for curing, and produces a more desirable product.

Fire Curing.—In this method artificial heat is used to hasten curing as well as to develop the characteristic flavour and aroma of fire-cured tobacco. As the name implies, heat is applied by means of open fires directly beneath the tobacco. The smoke from the burning wood imparts a creosotic flavour and a particular aroma, and at the same time improves the keeping quality of the cured product. Tobacco cured by means of open fires is greatly in favour in Europe, where it is used for various manufacturing purposes. There is also a considerable demand for this type of leaf on the West Coast of Africa, but there is no local demand.

For fire curing, tobacco should be heavy in body, smooth in texture, with large oily leaf and rich in nitrogenous constituents (Fig. 5). The soil for the production of tobacco suitable for fire curing should be well drained, naturally fertile, and the growth of the plants is further increased by heavy applications of manure or fertilisers. The plants are topped low so that only large leaf is produced, and the tobacco should be allowed to become fully ripe before harvesting.

The whole plant is harvested and placed on sticks in the field. After the tobacco has slightly wilted it is carted to the curing barn and hung in tiers with the sticks of tobacco about 6 inches apart. No fires are started until the leaf yellows, which requires from four to six days. Small fires are then made at intervals on the floor of the barn, and the temperature is slowly increased to 90° F. during the first 24 hours. The temperature is then gradually raised, by regulating the fires, to about 125° F. in three to four days, when the web of the leaf should be partially dry. The fires are then removed and the leaf allowed to become pliable through the moisture spreading from the midrib through the leaf web. Fires are then re-started, and the leaf again dried. This operation is repeated until the leaf, including the midrib, is thoroughly cured. The leaf is then brought into condition, stripped from the stalk, graded and either bulked or baled. In fire curing care must be taken not to

Fig. 5. Type of tobacco suitable for fire curing. (U.S. Department of Agriculture Yearbook.)

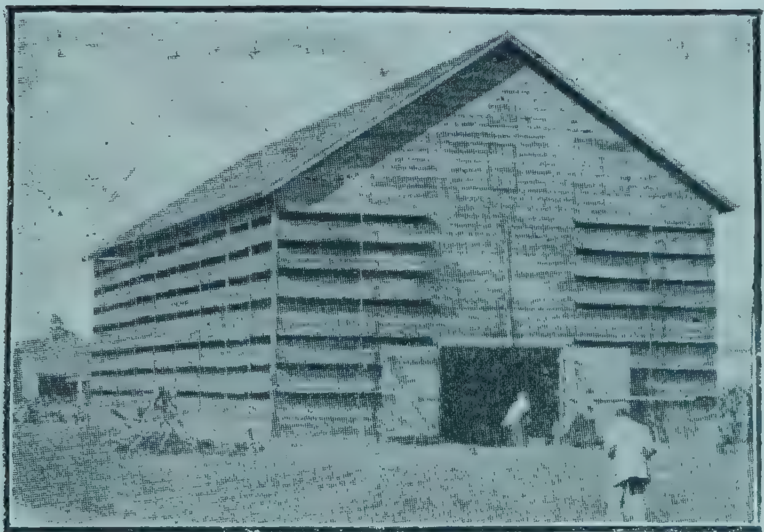


Fig. 4. Type of barn used for air curing in America.

Fig. 6. Curing barn for dark fire-cured tobacco. From U.S. Department

increase the temperature too rapidly in the early stages, or the leaf will dry prematurely and be of little value. From two to three weeks are required to effect a proper cure by this method. The barns for fire curing are usually small (Fig. 6), so that they can be easily filled with tobacco of uniform ripeness, simple in construction and inexpensive.

The amount of soil in Southern Rhodesia suitable for the production of tobacco of this type is limited, so that this method of curing will probably not be used to any extent in this Territory.

Flue Curing.—In this method, which is recommended for this Territory, the rate of curing is regulated by the use of artificial heat, which is distributed by flues passing around and through the inside of the curing barn. For plans and specifications of flue barns see the October, 1919, number of the *Rhodesia Agricultural Journal*. The heat is generated by wood fires in furnaces, and radiates from the flues, so that the flavour and aroma of the leaf is not influenced or contaminated by smoke as in fire curing. Heat is applied continuously from the time curing is commenced until all of the leaf in the barn is thoroughly dry.

Flue curing is the most modern and scientific method of curing tobacco, and requires careful attention to each detail. Good tobacco can be completely ruined in the curing process, while leaf of apparently poor quality can be considerably increased in value through skilful curing. The colour most desired in flue cured tobacco is a lemon yellow, as this grade of tobacco is greatly in demand and realises the highest prices. In any crop of tobacco, however, the cured leaf will shew all colours from bright yellow to dark brown. Green is the colour least desired, and care should be taken to so regulate the curing that leaf of this class will be reduced to a minimum.

In flue curing the aim of the tobacco grower is to hasten the yellowing of the leaf, and when the proper yellow colour is obtained to cure out the tobacco so that it still retains the desired colour. To secure this end five things are necessary:—(1) Suitable soil, (2) proper cultural operations, (3) suitable climatic conditions during the growing season, (4) the leaf to be harvested at the proper stage of ripeness, (5) correct management of the barn during curing.

Many formulas have been given for curing tobacco by this method, and any one of them is correct under certain conditions; but, unfortunately, it is not possible to alter all conditions to suit any particular formula. Tobacco grown on different types of soil, and often tobacco grown on different parts of the same field, requires different periods of time to yellow and to dry out. The same applies to the leaf harvested at different periods from the same plants on any given soil. It can, therefore, be seen that the formula which is correct in one case would be slightly wrong in another. Although no fixed and definite formula can be laid down, it is possible to give some general directions which, with good judgment, the grower can modify to suit his particular conditions. In flue curing tobacco which has been harvested by the single leaf method there are three stages to be observed, viz., yellowing the leaf, fixing the colour, and drying the leaf and midrib. If the whole plant is harvested a further stage is required to kill the stalk.

Yellowing.—The barn should be filled in one day with leaf of the same texture and in the same stage of ripeness, so that all of the leaf in the barn will yellow at practically the same time. When filled the barn should be tightly closed to prevent the escape of moisture, and a small fire started in each furnace. When the fires are started a thermometer and hygrometer are placed in the centre of the barn on a level with the first or lower tier of tobacco. The hygrometer is used to indicate the amount of moisture in the atmosphere of the barn, and is of great assistance during this stage of curing.

At first only small fires are required, but these are gradually increased until the thermometer registers about 90° F. It is imperative that low temperatures be maintained at first, as high temperatures would kill the leaf prematurely before it changed from green to a yellow colour; tobacco so treated has practically no value. A temperature of 90° F. is maintained until the leaf begins to yellow around the edges and at the tips, when the heat is raised to 95° F. and held until the colour begins to spread. The temperature is then increased to 100° F. until the yellow colour becomes more pronounced. During this time the atmosphere of the barn should be kept moist to prevent the leaf from drying. This is when the hygrometer is invaluable. Enough moisture must be kept in the atmosphere of the barn during this period, so that the temperature registered by the wet bulb of the hygrometer will not be more than 3° to 4° below that registered by the dry bulb. If a depression of 3° could be maintained the leaf would yellow more rapidly and more uniformly. When the wet bulb registers more than 4° below the dry bulb it indicates that the atmosphere in the barn is becoming too dry, and artificial moisture must be introduced into the barn. This can be done by wetting the walls below the tobacco, by pouring water over the floor, or by placing wet bags on the flues. When the leaf begins to shew a distinctly yellow colour the temperature is increased to 110° F. and held until the leaf is practically yellow, when the heat is raised to 115° F. and held until the leaf takes on the proper yellow colour. From 100° F. to 115° F. the amount of moisture in the atmosphere of the barn is reduced until the wet bulb registers from 6° to 7° below the dry bulb.

Fixing the Colour.—When the tobacco is properly yellowed the barn must be so managed that no further change of colour takes place in the leaf. This is the critical stage in curing, and requires the closest attention and the most careful manipulation. If the atmosphere of the barn is too humid, or if the ventilation is not sufficient, and the temperature is not increased fast enough, moisture will collect on the surface of the leaf and the tobacco will turn a reddish brown colour, or "sponge," which decreases its value. On the other hand, if too much ventilation is given, and the temperature is increased too rapidly, the leaf will be killed too quickly and a greenish red or black colour will develop, which greatly reduces the value of the leaf. The proper conditions are maintained when the barn is so ventilated that the moisture is carried off as fast as it comes to the surface of the leaf, and the temperature is so regulated that the colour will be fixed in 15 to 18 hours.

To secure these conditions the bottom and top ventilators should be slightly opened and the fires increased to maintain the temperature at

115° F. The ventilation and heat are increased and the temperature kept at 115° F. until the tips of the leaves begin to curl, when the temperature is increased to 120° F. and held until the leaf begins to dry. This condition is indicated by the leaves curling in towards the midrib. The temperature is then increased to 125° F. and held until the leaf appears to be dry, when the colour will be fixed.

Drying the Leaf.—To thoroughly dry the leaf the temperature is increased to 130° F. in two hours and held at this point for about four hours and then raised to 135° F. in one hour and held for four hours, when the web of the leaf should be quite dry. The ventilation is then reduced and the temperature increased about 5° per hour up to 160° F. and held at that point until the midrib is dry enough to snap when bent between the fingers. If the whole plant is being cured the temperature should be increased to 180° F. and kept for eight to ten hours to thoroughly dry out the stalk.

From four to six days are required to cure a barn, depending principally on the length of time required for the tobacco to yellow. The above temperatures are only given to serve as a guide, and each grower must modify them to suit the conditions which, according to his judgment, are existing at the time he is curing.

It might be well to point out that the rate of curing is influenced considerably by the temperature of the outside atmosphere, which replaces the air in the barn during ventilation. It will be found that higher temperatures are required in wet weather than in dry weather, and that lower temperatures are required in cool weather than in warm weather.

Management after Curing.—Regardless of the method used in curing, tobacco can be either increased or decreased in value by the method of handling employed after the leaf is cured. If properly handled the colour and quality of the leaf will improve, but if improperly handled considerable loss must occur.

The method of handling tobacco in Southern Rhodesia is peculiar to this Territory. When the tobacco is cured the leaf is brought into condition, baled without regard to size, colour or quality of leaf, and despatched to a central warehouse, where it is graded and prepared for market. This system is comparatively simple from the growers' point of view, but is radically wrong in many respects. In the first place tobacco does not improve in colour and quality when baled direct from the barn, as it should if bulked in proper condition on the farm. Secondly, the grower does not see his errors in curing and growing the crop, as he would if the leaf were graded and handled on the farm, and hence does not learn from his mistakes. Thirdly, if tobacco growing develops into an industry of considerable proportions, as it should do, the central organisation must reach abnormally large proportions to deal with the leaf produced.

The proper method of handling tobacco is to bring the leaf into condition after curing and place it in bulks or stacks, of convenient length and width and about 6 feet in height. Bulking can either be done with the leaf on the stick or by removing the leaf. In either case the leaf should be roughly graded and the leaf of different colours and

texture placed in separate bulks. The bulks of tobacco should be carefully watched, and should the leaf begin to heat or mildew through being in too high condition the tobacco should be re-bulked.

For handling tobacco in this manner a packing shed with conditioning cellar, similar to that shewn in the last issue of the *Rhodesia Agricultural Journal*, should be provided. The shed would be used for bulking and grading and the cellar for conditioning the leaf. The size of the building would naturally be altered to suit the requirements of the individual grower. If the grower preferred to use steam for conditioning tobacco, the cellar could be dispensed with and a room suitable for this purpose would be provided. The method of handling tobacco under this system is as follows:—As the tobacco is cured it is bulked until curing is completed. Each stack should be examined at regular intervals to ascertain the condition of the leaf, and if in too high condition the bulk must be turned. After curing is finished the tobacco first cured would be graded and either re-bulked or baled. Any leaf from the bulks which was too dry for handling would be lowered into the cellar or placed in the steaming room to be brought into proper condition. In grading the leaf would be sorted into the several grades of brights, mediums and darks. Damaged, perished or green leaf would be placed in separate grades. After grading was finished or when sufficient leaf of each grade was ready, the tobacco would be packed for market. In preparing the leaf for market, each package should contain only one grade of tobacco.

Leaf which is harvested ripe but cures out with a greenish colour can be greatly increased in value by this method of handling, as bulking removes the green colour and improves the aroma of the tobacco. Bulking also tends to develop a uniform colour in leaf which is lacking in this respect. Care must be taken in bulking tobacco to obtain the best results. If the tobacco is too dry, the leaf does not improve as it should, and if too moist mildew may develop, or the bright leaf may become darker in colour. When in proper condition for bulking or baling, the web of the leaf and lower half of the midrib, from the tip to the butt, should be supple, but the upper half of the midrib should be only slightly pliable.

With the present system of handling, there is annually a considerable loss through bad handling before the tobacco reaches the central warehouse for grading and marketing. The latter institution is usually blamed for this loss, through mismanagement, whereas the loss is usually due to carelessness on the part of the grower. The misunderstandings which result lead to friction between the parties concerned without preventing a repetition of the troubles which handicap the industry. Proper handling of the tobacco on the farms, including grading and preparation for market, would be both educational and remunerative to the grower, and would greatly assist in establishing the tobacco industry on a sound economic basis.

Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia.

By R. C. Simmons.

PART III.

FOR BEEF PRODUCTION.

In Part I. of this series (published in the *Journal* for August, 1919) we noted that the third main reason for feeding cattle was in order to fatten them for slaughter. It is only within recent years that this class of feeding has been at all seriously undertaken in Rhodesia, but experience teaches us that it is quite possible to produce prime beef, suitable for the best European markets, from our local cross-bred and grade stock by the use of feeds grown on the farm. The profit to be derived from feeding bullocks depends mainly on three variable factors which must always be considered in conjunction with one another, namely, the cost of purchasing or producing suitable store stock, the market for beef, and the value on the farm of feed. There are other considerations which may in many instances render it advisable to feed beef notwithstanding that the foregoing main factors militate against an appreciable direct cash profit. They are, firstly, the necessity for periodically growing crops in rotation with grain crops which are not easily marketable in a raw state, and secondly, the necessity for producing manure or, in other words, of returning to the farm some portion of the crops grown in order to maintain its normal fertility.

Owing to the gradual but satisfactory development of the overseas beef trade, at present conducted through Union channels, the establishment of a canning factory at Odzi, and a very considerable demand for beef in the Congo, which is likely to increase, the difficulty which we have often experienced hitherto, of selling our beef as it becomes fit, is one which we may confidently hope will soon be a thing of the past.

It appears to the writer, that although the market is by no means unlimited, a great many farmers may feed a truck-load or so of oxen with considerable advantage to their annual cash receipts and indirectly to the general productiveness of their farms.

It is very necessary to choose the right type of bullock for feeding purposes. It may be said at once that the native oxen do not pay to

feed over and above maintenance rations as described in Part I. of this article. While cross-bred Frieslands and other cross-bred dairying stock sometimes become very heavy and occasionally produce excellent slaughter animals, bullocks bred from extreme dairy stock are not often very satisfactory feeders. The ideal beast is one with one or more crosses of recognised beef blood and free from extreme dairy blood. He should possess, above all things, constitution, as indicated by (1) a compact form, wide, deep and level, and of medium length; (2) a head of medium length and broad, with large open nostrils, strong muzzle and mild expression; (3) a neck medium to short, tending to unite smoothly with the head and gradually widening and deepening towards the shoulders; (4) broad, wide, deep and full chest and heart girth; (5) legs medium, not coarse in the bone; (6) skin of medium thickness and covered with soft hair; (7) a general appearance of thrift and well-being.

It is extremely important that a beast should handle well, and if possible, when selecting bullocks for feeding purposes, one should handle them. When the animal is in ordinary healthy condition the skin of a bullock likely to fatten well will feel pliable and mellow when taken up between the thumb and fingers. If the hand be laid flat on the skin above the ribs and loins, and a slight pressure with a gentle rubbing movement be made, the presence of an abundance of connective tissue between the skin and the muscle or flesh will be realised.

The best age to fatten varies a good deal with circumstances and the requirements of the market, but generally speaking under present conditions one will do best to feed so that the animal is disposed of at from 3½ to 4 years old. One would therefore select store oxen having three pairs of permanent incisors up. Feeding is usually undertaken in the winter months, so that the finished animal may be placed on the market in August, September or October, when grass-fed beef is scarce. Taking four months as the maximum time it will pay to feed for ordinary commercial purposes, one will need to commence feeding say in May. Advantage may be taken of good late grazing, maize stalks and so forth, and younger bullocks which it is desired to market later may be run in the day time and fed at night for a month or so before heavy feeding is commenced. It is essential that the bullocks should be sold as soon as they are fat. Feeding for a month too long may mean the difference between profit and loss. The average farmer, especially amongst those more recently established, who are not too well provided with buildings, will fatten their beasts loose in small yards or kraals with some kind of lean-to shelter on the weather side. In some cases oxen may fatten satisfactorily when tied up, but old trek oxen and ranch cattle are liable to fret under these conditions. Since all bullocks will not feed alike, it will usually be as well to put up say two truck-loads at least, so that they may be sorted out according to temperament; the best may be marketed first, and railage considerations, etc., will not necessitate selling them all at one time.

It may be mentioned that if properly bedded up, each bullock fed will produce about half a ton of manure, a factor which must by no means be overlooked in reckoning up the profit or loss. Most farmers have at some time or other a number of old trek oxen (of the ordinary

mixed type) to dispose of; these may be fattened with advantage for the compound trade. With such cattle one must remember that they have long since finished growing. They will probably be in hard lean condition, if not actually poor, and will repay for a liberal allowance of cheap succulent food. Their ration may be fairly wide, and may contain a good deal of cheap bulky fodder. In a good season these old oxen may be run for a month or so on the maize stalks according to the season, and then may be put up into yards and fed a ration such as either of the two following examples for a period of, say, 70 days.

Fattening ration for aged trek oxen:—

(1) Maize silage, 25 to 30 lbs.
Maize meal, 7 lbs.
Teff hay, 10 lbs.
Ground nuts, 3 lbs.

(2) Maize silage, 25 to 30 lbs.
Maize meal, 7 lbs.
Velvet bean hay, 10 lbs.

In both cases rough veld hay should be fed as required and principally used to rack up with at night. Sweet potatoes, majordas, pumpkins, etc., may be substituted for the ensilage, and towards the end of the feeding period the succulence should be lessened and the dry food gradually increased. A mixture of foods and a periodical change of food will always be found beneficial.

With younger and better bullocks, that is to say, with good three-year-old untrained oxen, having a tendency, due to their improved beef blood and to the fact that they are still growing, to assimilate food economically, a different and possibly a more expensive ration should be adopted. At the same time there is no reason to go outside the farm for suitable foods. A ration somewhat as follows would be suitable:—

1st period—Maize, 7 lbs.
Maize silage, 20 lbs.
Velvet bean hay, 10 lbs.
Ground nut vines, 5 lbs.
Veld hay as required.

2nd period—Gradually reduce the silage to 10 lbs. and add 2 lbs. of bean meal.

The ground nut vines may be replaced in either period by 5 lbs. of lucerne if available. In order to provide succulence the ensilage may be replaced by pumpkins (which will improve the ration). Green barley or rye will be found useful substitutes for ground nut vines, but must be fed in rather larger quantities. Sweet potatoes are a starchy feed, and while they will form an excellent succulence for older cattle, an increased supply of foods such as beans, ground nuts, sunflower seed, linseed, peas or velvet bean hay should be fed with them when given to younger animals. Teff and many other cultivated hays are valuable feeds and may, with good results, replace portions of the veld hay in the ration. The writer would draw attention, however, to the special value of leguminous hays such as velvet bean hay for the purpose of balancing

the maize and other more starchy portions of the ration. They are specially valuable in the later stages of feeding when it is desired to keep the ration comparatively dry.

When commencing to get bullocks on feed the bulkier and more succulent feeds should be fed first, the grain and more concentrated portion of the ration being gradually introduced. Occasionally some trouble is experienced in getting ranch cattle to feed. A good method is to stall them alongside some cow or bull that is accustomed to feeding, when they will in most cases soon learn. Under a system of intensive feeding such as the above bullocks should be on full feed at the end of about two weeks. They may feed indifferently and fall off in weight at first, but will soon make up this loss. We have said that feeding will usually be undertaken in the winter months; it is not, however, essential that the bullocks should be finished before the reappearance of the grass. On farms where good and fairly early grazing is available it may be worth while to put the bullocks in kraals or yards and feed them during the winter on a cheap, bulky ration not greatly in excess of a maintenance ration, and to fatten them on the grass with the aid possibly of 3 or 4 lbs. of maize per diem. The period of feeding will in such a case be six or seven months altogether. The finish of the bullock will not be so good as when fed entirely in stalls, but the cost will be comparatively low and a good deal of manure will be made. When the bullocks go out to graze in spring or early summer, an hour or so per day is sufficient at first. They are thus gradually accustomed to the new green feed; at the same time the bulk roughage should be gradually reduced and replaced by a concentrated feed, ultimately amounting to perhaps 6 lbs. of maize and veld hay as required. The grazing and feeding should be continued for about two months, so that the bullocks may be marketed at Christmas. Under such a system a ration as follows is suggested for the winter months, say from June to October inclusive:—

Silage, 20 lbs.
Veld hay, 10 lbs., or *ad lib.*
Velvet bean hay, 5 lbs.

The silage might be replaced by majorda melons or sweet potatoes, the velvet bean hay by teff and ground nut vine, or teff and sunflower seed, or by 1 lb. or so of ground nuts. An occasional change from one feed to the other or a mixture of the various feeds would in any case be advantageous. It is assumed that the grazing is fairly close to the yard, so that the bullocks will not have to walk far, or that the feed is given in the paddock or camp.

Gwebi Experiment Farm.

REPORT ON CROP EXPERIMENTS, 1918-19.

MAIZE.

A manurial experiment was undertaken with the Hickory King variety to test the effect of the commercial fertilisers available at that period. The analyses and prices of these fertilisers are as follows:—

Fertiliser.	Price per Ton.	Nitrogen, per cent.	Phosphoric Oxide, per cent.				Potash, per cent.
			Soluble in Water.	Soluble in citrate solution, less phosphoric, and soluble in water.	Soluble in 2 per cent. citric acid solution.	TOTAL.	
Lochrin ...	£15	1·5	0	—	3	13	2
Salisbury Fertiliser	£12 10s.	1·6	·77	4·26	8·07	8·07	2

200 lbs. of each were applied for comparison with unmanured plots, the whole experiment covering an area of 65 acres.

Experiment No. 1.—On old land somewhat below the average fertility of the prevalent red soil. During the period of growth little or no difference was observable in the general appearance of the different plots, and the subsequent yields confirm the impression then gained that the beneficial effects of the manurial dressings were unappreciable.

	Yield of grain per acre.
No manure (2 acres)	1,655 lbs.
Salisbury fertiliser (4 acres)	1,660 ,,
Lochrin fertiliser (4 acres)	1,405 ,,

An additional plot of 4 acres was dressed with the 1917-18 Salisbury fertiliser after a previous crop of dhal. This gave a yield of grain at the rate of 1,795 lbs. per acre.

Experiment No. 2.—A similar experiment to the last, but on poor land with a clayey sub-soil, rendering the top soil sensitive to extremes of drought and moisture. The application of fertiliser here seems to have been more effective, as compared with untreated land. The yields of grain were as follows:—

	Yield of grain per acre.
No manure	650 lbs.
Salisbury fertiliser	760 ,,
Lochrin fertiliser	1,180 ,,

An adjoining plot of 35 acres uniformly treated with Lochrin fertiliser at the rate of 200 lbs. per acre gave an average yield of 1,160 lbs. grain per acre.

Experiment No. 3.—The soil selected in this case had been under crops for three years only, as contrasted with the two previous trials on soils under various crops for over 10 years. The effect of the drought in March was evident on these plots, and it is likely that the heavy rains earlier in the season interfered with the action of the fertiliser. The weights obtained were as follows:—

	Yield of grain per acre.
No manure	1,560 lbs.
Salisbury fertiliser	1,565 ,,
Lochrin fertiliser	1,410 ,,

Experiment No. 4.—This is the main crop of Salisbury White maize grown on the Gwebi Experiment Farm. It is satisfactory to note that the average yield from this crop over an area of 114 acres was at the rate of 10.4 bags per acre. This area included some new land brought under the plough for the first time this season. Taking the old land, an average of 13.2 bags per acre was obtained after one ploughing. Similar treatment in the case of new land gave only 7 bags per acre. Where, however, the new land had been ploughed *twice*, the yield rose to 9.4 bags per acre. These figures are instructive and should prove of interest to maize growers.

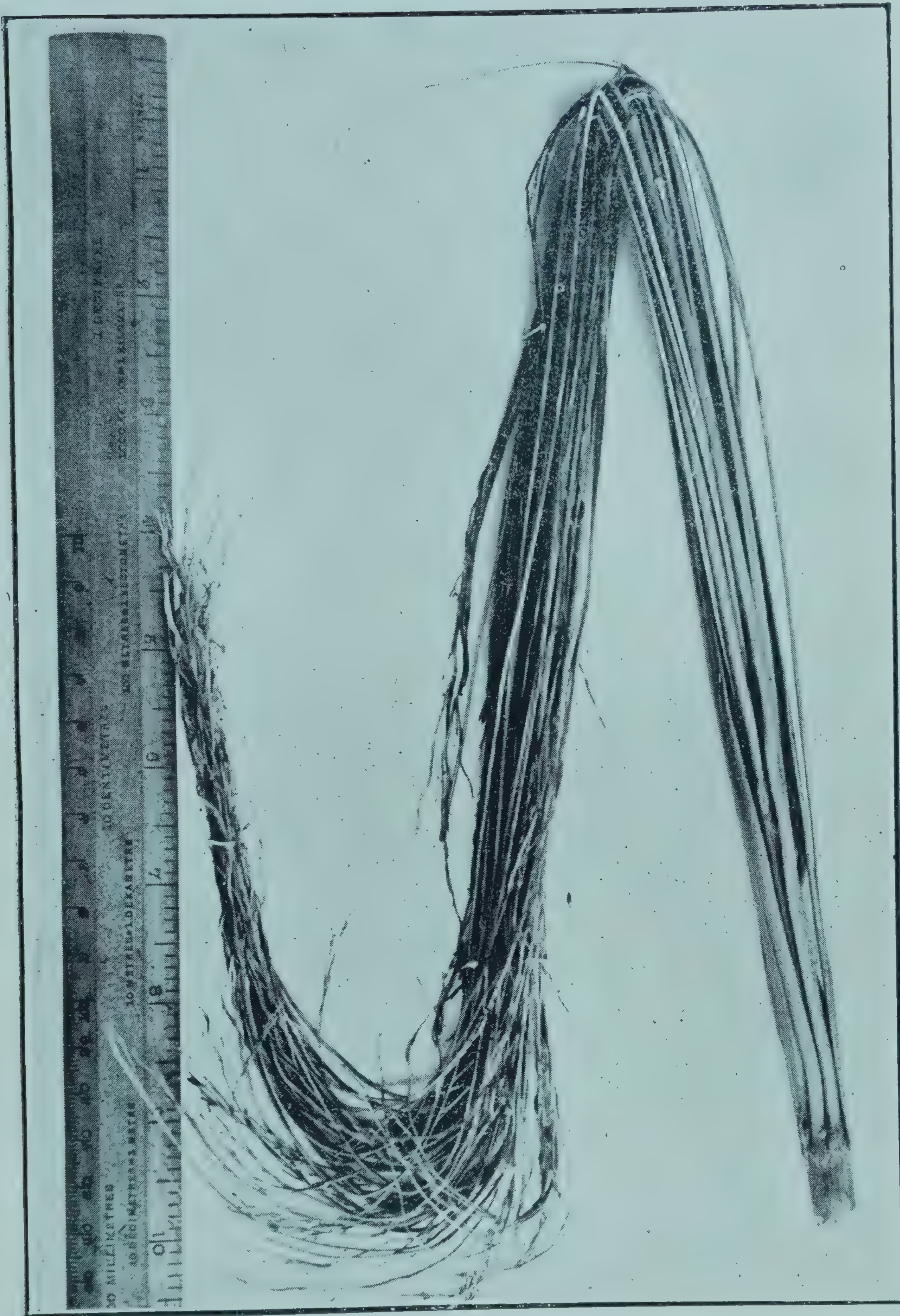
OIL AND FIBRE CROPS.

Ground Nuts.—*Experiment No.* 1.—An experiment was conducted to test the effect of fertilisers on this crop. Two control plots were used, one of new land unmanured, and one of old land also unmanured. The variety used is that known as Spanish, and was planted in the middle of December, being ready for lifting early in April, having thus occupied the ground for about four months. Good germination was obtained, and the plots appeared exceedingly promising during the first two months. The subsequent drought during March, however, appreciably affected the yield. The weights given below shew that the fertilisers used did not have a very marked effect on the yields.

	Yield in pounds per acre.
New land ($2\frac{1}{2}$ acres), no manure	392
Old land (2 acres), no manure	790
Old land, Lochrin fertiliser (200 lbs. per acre over 4 acres)	875
Old land, Salisbury fertiliser (200 lbs. per acre over 4 acres)	740

The advantage of old land as against new ground for this crop is clearly demonstrated.

Broom Corn, ready for bending over. Experiment farm, Gwebi, March, 1919.



Broom Corn Head. Minimum size required by Capetown market.

Experiment No. 2.—This crop was grown over 14 acres after a previous crop of Boer manna, without manure. The weather conditions militated against a good return, but over 10 acres a yield of 4,000 lbs. of nuts was obtained, or at the rate of 5 bags per acre. The hard, dry state of the ground made harvesting a laborious business.

Linseed.—This crop was grown on 5 acres of land, and the total yield came to nearly 5 bags of seed. Even at this rate it is probably worth growing for feeding on the farm on account of its high nutritive value. One of the principal problems in connection with this crop is that of combating the insect pests which in the form of caterpillars eat off the young growing plant, and in the form of grubs eat the seed in the pods. When free of these pests yields of three bags of grain per acre have been obtained in this country.

Sunflowers.—This season of consistent rainfall was a good one for this crop, and had the rains lasted well into March ideal yields might have been looked for. The plants grew to maturity without a check, and the yields were fairly good, averaging 720 lbs. per acre throughout, or from 6 to 7 bags. The seeds were plump and well filled, and the bushel weight well above the average of about 27 lbs. for the Rhodesian article.

Sunn Hemp (*Crotalaria juncea*).—This leguminous green manuring and fibre crop has given uniformly good results over a long period of experimentation under Rhodesian conditions. It grows vigorously and seeds freely, and promises to be of value as a green manuring plant for all kinds of land, but more particularly for citrus orchards. The plant attains a height of 6 to 7 feet, and should be ploughed in preferably when in the flowering stage. For this purpose it should be sown as late as the end of December, while the seed patch should be sown as early as the beginning of December. The value of this plant as a fibre producer is well recognised in India. The subject of its fibre value in Rhodesia is now under observation, but no definite pronouncement is possible for the moment.

Broom Corn.—This crop was sown early in December, but was not ready for harvesting until the first week of May, when the stalks were cut about 3 ins. below the heads. The two kinds of fertilisers obtainable last year were both applied at the usual rates, the plot receiving Lochrin fertiliser being the most vigorous in its subsequent growth. Stalk borer only made its appearance about the middle of March, but did no considerable damage. Had the crop been kept for seed a very heavy yield would have resulted. It was cut, however, before the seed had filled out, but for the sake of comparison the weights of both seed and fibre were recorded.

	Per acre.	
No manure	133 lbs. fibre.	190 lbs. seed.
Salisbury fertiliser	83 ,,	110 ,,
Lochrin fertiliser	225 ,,	275 ,,

In the preparation of this crop for fibre it is advisable to bend the tops over about nine inches below the head. This should be done before the fibrous branches are entirely out of the sheath and while the head is still compact, so as to prevent the branches from bending outwards.

The commercial aspect of this crop has been ascertained by the despatch of samples of the Rhodesian grown article to various broom manufacturing firms in the Union, and in one case a large consignment was forwarded for sale. This realised only £15 per ton delivered in Capetown, the manufacturers stating "if it can be produced in longer lengths we can pay up to £30 per ton." Of course at £15 per ton the heavy railage and forwarding charges would prevent its being a payable crop for the Capetown market. Other extracts from replies by manufacturers furnished on the crop grown in 1917-18 will indicate to some extent the position Rhodesian broom corn is likely to take on the South African market:—"Samples A, B and C we consider of fair quality, although by no means good, and if the bulk is like the samples, we consider it worth £35 per ton delivered here. D we would value at £15 per ton, and E at £20 delivered here. At the above prices you may send us all you have."

Another report was as follows:—"We confirm the opinion that in normal seasons it would be successful. Taken altogether, the samples submitted are not up to the average quality of the imported corn, the colour is poor and not sufficient in length. From the samples sent we can only make three-tie brooms, which are the shortest. Even then the shorter lengths predominate, and do not allow the corn to be 'self-working,' which is the recognised trade term for a good all-round broom corn. We should estimate the value to be not more than £20 per ton in Capetown. If the corn could be produced in longer lengths and a better colour, it would increase the value considerably—say to £35 per ton."

GRAIN CROPS.

Oats.—The variety used for summer cropping at the Gwebi Experiment Farm was exclusively Kherson's sixty-day. This crop deserves note on account of the fact that although the seed had been Rhodesian-grown for many years, it succumbed entirely to rust in the middle of February. The crop was sown in the third week of December, which is rather earlier than the usual practice. The application of Salisbury fertiliser at the same rate as for maize did not seem to benefit the crop or to increase its rust resistance.

Rye.—This crop germinated well, but the plants to a large extent were eaten off when about 12 ins. high. Those that survived grew to a uniform height of four ft., but the stand was very thin. It entirely escaped rust. This crop is to be recommended particularly for our sandy soils.

Emmer.—This crop was grown on a three-acre plot adjacent to stands of wheat and oats, and although the latter suffered severely from rust there was none on the emmer. The quantity of fodder obtainable from this crop would have been very heavy, but the plot was kept for seed. In this respect the yield was disappointing, giving only 225 lbs. per acre. This was probably due very largely to the fact that the crop was planted too late and suffered considerably from the drought in March, and did not ripen until after the frosts had commenced.

Inyouti (*Pearl millet*).—In this case an attempt has been made to fix by selection a native variety having long awns or beards and said to

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Emmer Wheat.

be bird proof. The crop has done very well, but the type is far from breeding true, although all the seeds used were obtained from the long bearded variety. The yield of seed was at the rate of 400 lbs. per acre, which is perhaps a payable quantity at present market prices, and when it is considered that it is regarded as equal to barley for feeding purposes.

Buckwheat.—A yield of 410 lbs. per acre was obtained off a crop sown in the third week of November. As a rule it is not advisable to sow this crop as early in the season as this date, as it is necessary to get the land as clean as possible for a crop which cannot be cultivated effectively after sowing. In this case the weeds which appeared before the crop had matured materially affected the yield which it would otherwise have been possible to obtain.

Another experiment embodied an attempt to grow two crops of buckwheat the same season on the same land, and it will be remembered that a similar attempt made last season failed through the occurrence of early frost in May, which damaged the second crop in the flowering stage. In the present instance the complete drought which followed after February, 1919, prevented the second crop from attaining a healthy maturity, and the attempt must be classed as a failure. It has already been shewn, however, that crops of buckwheat sown as late as March have given profitable yields of grain. The first crop harvested in the first week of February gave a yield of 340 lbs. of good, plump seed per acre.

It would seem that in favourable seasons a second crop on the same land may advantageously be sown, especially if there has been much shedding of seed from the first crop, but that there is a probability of the second crop failing to mature unless weather late in the season happens to suit it.

MISCELLANEOUS FODDER CROPS.

Velvet Beans.—Both the ordinary Florida bean and the White Stingless variety were grown for comparison. Both kinds were sown on the 20th December, and were cut for hay four months later, while in the case of seed they were allowed to remain another month. It was noticeable that the wet season experienced was unfavourable to this crop, and in parts of the land where water was inclined to stand the return was very small indeed. The White Stingless variety again proved superior to the Florida, although the yield of hay did not exceed 1,200 lbs. per acre, which is about half the yield in a good season. The yield of seed suffered in the same way from the same cause, giving in the case of the Stingless variety an average of only 310 lbs. per acre over seven acres.

Pumpkins.—This crop undoubtedly suffered from the heavy rainfall during February, which caused the vines to rot and prevented any further growth of the gourds. The result was that the pumpkins were small in size in spite of a liberal dressing of kraal manure, and only a yield of 2½ tons per acre was obtained.

Sweet Potatoes.—This crop was in its second year, having been manured the previous year with kraal manure, and the experiment was

a test of how the sweet potatoes would do in the same ground without replanting the slips. The growth of foliage above ground was dense, and an attempt to convert this into hay resulted in over a ton of dried hay per acre. The process of drying was, however, long and the hay looked stalky, but was much relished by the cattle and sheep. The tubers underground did not fulfil the expectations raised by the wealth of foliage, being small and fibrous and far poorer than they were in their first season. The yield of tubers amounted to 7,200 lbs. per acre. It is fairly obvious that this crop should be replanted in fresh ground each season.

Field Radish.—After a series of successful trials at the Experiment Station at Salisbury this crop has been under extended trial at the Gwebi Farm, and during the last two years the results have been satisfactory. Field radish is the only cruciferous crop that escapes the destructive attention of summer pests in this country, and the yield of roots is sufficiently high and consistent to warrant a trial by farmers who are anxious to add to the list of foodstuffs useful for stock feeding. Fourteen tons of roots were harvested this season off three acres, and when fed in conjunction with maize meal was greatly relished by stock. This crop was sown with the planter in rows $2\frac{1}{2}$ ft. apart in the middle of December, and the plants were later on thinned out to 8 ins. apart in the rows. About 10 lbs. of seed were used per acre, and the crop was lifted as required during April and May.

Boer Manna.—This crop seems to have suffered considerably from the excessive rainfall, and where the water was inclined to lie the yield was poor. On the higher ground the crop was a great success this season, yielding about $1\frac{1}{2}$ tons of hay per acre, and when kept for seed giving over three bags per acre. This confirms previous trials in the conclusion that manna suffers very considerably from excess of moisture, but is otherwise one of the best hay crops we have and continues to compare favourably with many more modern innovations. Taken one season with another it is a reliable cropper and an invaluable rotation crop, deserving wider popularity than it generally enjoys.

Sudan Grass.—Grasses for hay or other purposes are not usually treated manurially. The point as to whether they are beneficially affected by manurial treatment is, however, of sufficient interest to have warranted this trial. Seed at the rate of 8 lbs. per acre was sown, far less than is the practice in America, but sufficient for Rhodesian conditions. It is well to note that when used for a smother crop about double the above weight is necessary. This grass occasionally suffers in this country from an insect pest similar or perhaps identical with the stalk borer in maize. This pest made its appearance on the crops under review and undoubtedly affected the yield adversely. Lochrin and Salisbury fertiliser at the rate of 200 lbs. per acre was applied for comparison with a control plot, but the yields as given below do not seem to indicate that any marked improvement resulted.

Fertiliser.	Yield of hay per acre.
Nil	1,352 lbs.
Lochrin fertiliser	1,370 ,,
Salisbury fertiliser	1,300 ,,

Sudan Grass, April, 1919.

Experiment Station, Salisbury, 1919.

Napier Fodder.—This experiment to test the effect of planting out slips at different distances is in its third season. Reports on the results obtained in the first two seasons were given in the *Rhodesia Agricultural Journal* for October, 1918, page 443. As was to be expected in the earlier stages of growth while the plants were small, the closer spacings gave a comparatively higher weight of fodder. As the plants grew and spread the closer plantings became choked and the yield of fodder was reduced considerably. On the other hand, the wider plantings found room to spread and develop. It would seem to be necessary in planting out this crop to allow ample room for cultivation and expansion, otherwise the plants are apt to get root-bound and to die out in consequence. The weights of green fodder taken at the end of February or beginning of March are given for the three seasons.

	1918-19.	1917-18.	1916-17.
6 ft. x 6 ft. planting	10,360 lbs.	5,400 lbs.	5,400 lbs.
4 ft. x 4 ft. ,, ...	11,000 ,,	7,200 ,,	9,000 ,,
4 ft. x 3 ft. ,, ...	10,890 ,,	7,200 ,,	10,800 ,,
4 ft. x 2 ft. ,, ...	10,720 ,,	9,000 ,,	12,100 ,,
2 ft. x 2 ft.; 2 ft. x 1 ft.; $1\frac{1}{2}$ ft. x $1\frac{1}{2}$ ft. } average	8,980 ,,	8,100 ,,	11,700 ,,

Cassava.—In view of the possibilities of this crop for commercial purposes it was grown on a fairly big scale at Gwebi with a view to testing its yields and the improvements that might be effected by manurial treatment. It was also proposed to prepare samples of cassava starch for examination by European experts in the Home markets. The fertilisers used were applied at date of first planting in 1916, but with the exception of the kraal manure none of them seemed to impart any marked benefit to the crop.

Two varieties of this crop were grown in this experiment, and of these that known as Variety No. 2 was distinctly more vigorous and promising than the other. The roots were harvested during March, 1919, and gave yields varying from four tons per acre in the case of No. 1 to over five tons for No. 2. This yield of course represents three years' growth, and therefore would not seem to compare well with other root crops such as potatoes, for which assured markets can be found. The cost of growing cassava is, however, comparatively low. The larger tubers were treated for the production of starch, while the smaller ones were very successfully fed to the cattle and sheep.

Tobacco Pests of Rhodesia.

By Rupert W. Jack, F.E.S., Agricultural Entomologist.

PART I.

A previous contribution to this subject included in the Handbook of Tobacco Culture, published by the Department in 1913, is now considerably out of date. Whilst no new pests of importance have come to light in the intervening years, our knowledge in respect to known pests has increased, and some of the recommendations, especially in respect to cutworms, have had to be modified. The revival of the tobacco industry and consequent extension of the acreage under this crop renders a revision of the original account highly desirable.

The chief insect troubles which planters in this Territory have to fight are connected with the seedbeds and the newly planted crop. Once the plants have become well established in the field there is, as a rule, little danger of serious loss from this source, although in certain seasons cutworms are a continuous nuisance, and budworms commonly call for attention. In this respect Rhodesian planters have a distinct advantage over those in America, where the crop has usually to be sprayed two or three times during growth to check the ravages of certain hawk moth caterpillars, known locally as "hornworms."

Cutworms* (see Plates I. and II.).—Cutworms are smooth caterpillars, the larvæ or young of certain inconspicuous night-flying moths. Four species, namely, *Euxoa segetis*, Schiff., *E. longidentifera*, Hmpsn., *E. spinifera*, Hubn., and *Agrotis ypsilon*, Roths., have been identified as attacking tobacco in the Territory, but of these only the first and last are of real importance, the remaining two species having only been found in small numbers associated with the others. The adult moths of the four species are shewn on Plate I.

Cutworm moths are on the wing throughout the year. They are of nocturnal habits, lying hidden in sheltered situations throughout the day. In warm weather the females begin to lay about four days after emergence. The eggs are laid in great numbers amongst suitable low-growing vegetation, attached to the stems of plants, to stones, lumps of earth, sticks or other stable objects. One female, *E. segetis*, laid as many as 1,766 eggs in confinement, a figure that should give some idea of how such immense numbers of cutworms may appear suddenly in favourable situations. The eggs hatch in from five to eight days.

The very young cutworms feed mainly on prostrate leaves and other soft tissue within their reach, but will frequently ascend a plant for an inch or so in order to reach the lowest leaves. They keep in seclusion as much as possible, hiding under leaves and rubbish. Later they

*For a full account of the Rhodesian species of these insects see an article in the *Rhodesia Agricultural Journal* for June and August, 1918. Copies in pamphlet form are available (Bulletin No. 291).

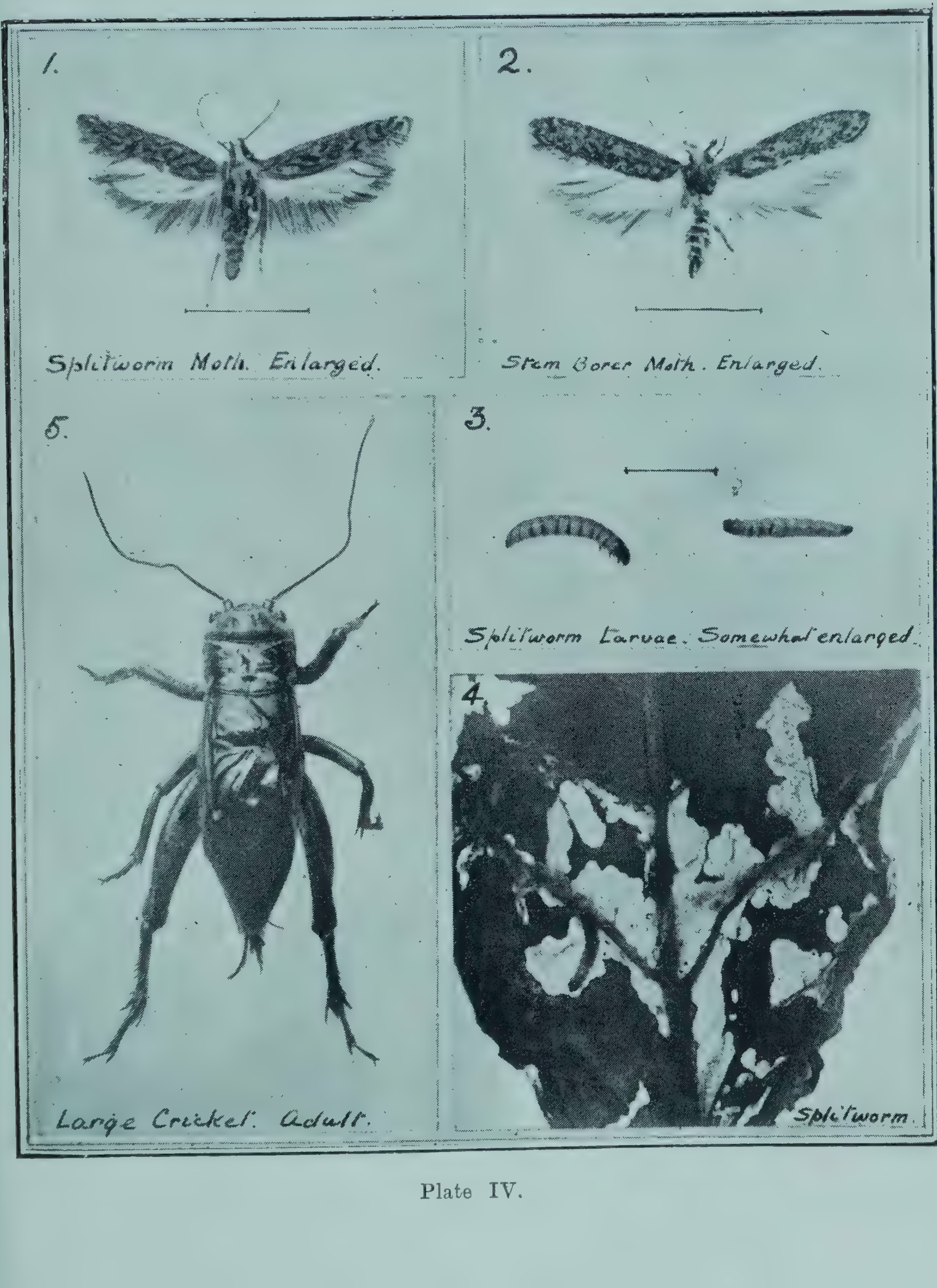
1.
Splitworm Moth. Enlarged.
2.
Stem Borer Moth. Enlarged.
5.
Large Cricket. Adult.
3.
Splitworm Larvae. Somewhat enlarged.
4.
Splitworm.

Plate IV.

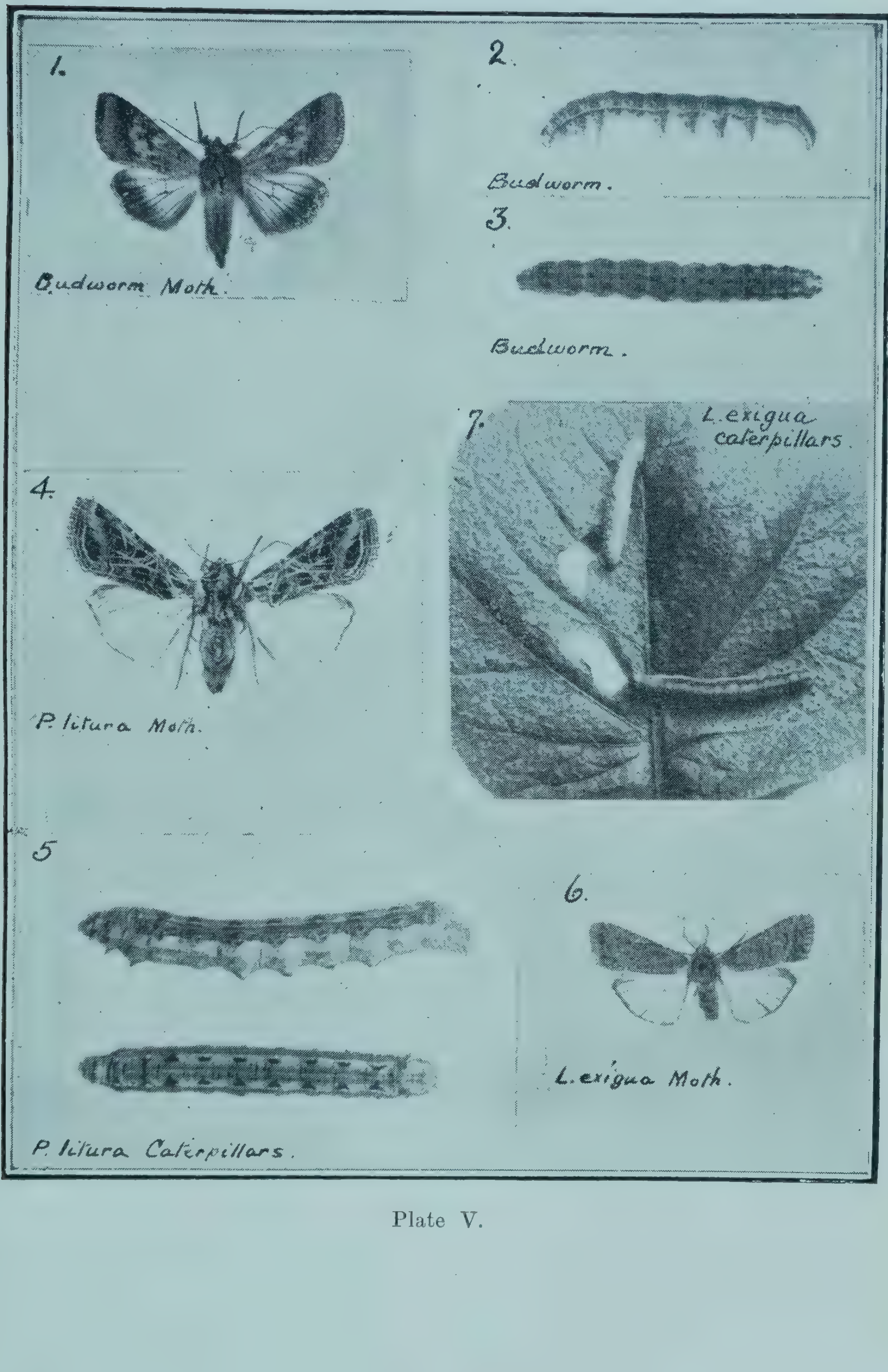
1.
Budworm Moth.
2.
Budworm.
3.
Budworm.
7.
L. exigua caterpillars.
4.
P. litura Moth.
5
P. litura Caterpillars.
6.
L. exigua Moth.

Plate V.

develop the habit of burying themselves in the soil during the day and feeding at night; as they grow larger, they feed upon the stems of plants at the ground level, frequently severing small stems completely in a single night, so that the young plant is seen lying on the surface of the soil in the morning. This characteristic habit is the origin of the name "Cutworm."

The growth of a cutworm from the time of hatching to pupation may, under summer conditions, be completed in as little as twenty-nine days, but the average is a few days more. In cold weather the growth may occupy several months. When full-grown the cutworm enters the ground for an inch or two and there constructs a cell or cocoon of soil particles cemented together. Within this cell it changes to a brown pupa or chrysalis, emerging as a moth in from a fortnight to three weeks in the summer, but taking longer in the winter. The broods are quite irregular throughout the year, moths having been bred out during every month. There are probably about four complete generations of *E. segetis* during the year.

Control.—Attack on *seedbeds* may be due to one of two different causes. The surroundings of the seedbeds may be infested with cutworms which later invade the beds themselves, or more commonly the eggs are laid by the parent moth amongst the young seedlings, and cutworms and plants grow up together. In the latter case the damage tends to be continuous, as a very small cutworm is quite capable of demolishing a germinating tobacco plant, and larger specimens will sever anything of the nature of a seedling.

Preventive measures in connection with seedbeds, therefore, lie in keeping the ground around the seedbeds as free as possible from vegetation, in order to discourage moths from laying eggs there, and in constructing the beds in such a way that moths are excluded. For the latter purpose, the sides need to be built of brick neatly finished, and the covers to be in one piece, free from holes and carefully weighted down so as to leave no chink through which a moth might enter. During the hardening off process covers should be replaced before sundown. It must never be overlooked that the seedbed, with its artificially stimulated array of succulent plants, constitutes a strong attraction to female cutworms desiring to lay, on account of the scarcity of such vegetation elsewhere during September and October, and that the defences need to be correspondingly effective. It may further be noted that although the moths are nocturnal in habit, they may be disturbed from weeds and herbage by anyone moving about during the day and immediately seek another resting place. In this way female moths may be driven from weedy surroundings into beds which happen to be open at the moment, with the result that a few hundred hungry cutworms may put in an appearance shortly after. Clean surroundings are therefore desirable from all points of view.

As a further protection the young plants from the time they shew foliage of the size of a sixpence may be sprayed weekly with arsenate of lead (paste)* 1 lb.—16 gallons, or arsenate of lead (powder) 1 lb.—

*All brands of lead arsenate are not equally efficacious. Of those stocked by Salisbury merchants, Fergusson's and Cooper's brands have given good results in tests carried out at the agricultural laboratories.

30 gallons of water. This will prevent cutworms developing in the beds, as the young cutworms attack the leaves of the young seedlings and so ingest the poison. It is useless to wait until large cutworms are present, as these will not yield to any known treatment other than the laborious method of hand-picking.

Attack on crops in the field may be due to a weedy condition of the land previous to planting, or to an invasion from the neighbouring veld. Up to the present such attack has only been recorded during an unusually wet season, or in regard to tobacco lands which are very low lying. It has been proved definitely that cutworms in this Territory do not pass the winter in a half-developed condition and attack the crop in the spring, as is the case in cooler latitudes. They must either feed up and pupate, if food is available, or starve if it is not. The temperature, especially during the latter part of the dry season, is too high to allow of the vital processes of the caterpillars being suspended until the next crop is available for food. It follows, therefore, that cutworms which attack the young plants as soon as they are planted out are the result of eggs laid a few weeks previously either amongst the herbage of the neighbouring veld or amongst weeds on the land itself. As a matter of fact most outbreaks are traceable to the latter cause. Prevention therefore lies mainly in *keeping the land free from weeds up to the time of planting.* Serious invasion from the surrounding veld probably takes place but rarely in respect to tobacco lands, and is then usually due to the proximity of a naturally wet vlei. It is difficult to avoid.

The standard *remedy* for cutworms all over the world is poisoned bait. Paris green, molasses and water mixed with bran has been found very efficacious in North America. In the South African Union arsenite of soda, sugar or molasses and water, used to wet chopped greenstuff, such as lucerne, potato tops, etc., is recommended. It has, however, been found that in this Territory the commonest cutworm, namely, *E. segetis*, is repelled by arsenite of soda, and is not attracted to a great extent by bran or meal baits. Paris green is, on the other hand, an effective poison, and greenstuff is, of course, attractive. It is questionable whether the addition of sugar or molasses adds to the attractiveness of fresh greenstuff, but it certainly increases the adhesiveness of the Paris green, and may help in regard to attractiveness if the greenstuff is wilted. The following formula is recommended:—

Paris green, 1 lb.
Crude molasses, 2 gallons.
Water, 10 gallons.

The greenstuff needs to be of a succulent nature. Potato tops, lucerne, young maize or kaffir corn, barley, lettuce, turnip tops, rape, etc., etc., are suitable. The greenstuff should be chopped up into short lengths, dipped in the liquid, which must be kept stirred, drained and distributed broadcast but very thinly over the infested land. This is preferably carried out in the late afternoon, so as to be as fresh as possible during the night when the cutworms feed. A chaff-cutter saves a great amount of labour in cutting the greenstuff.

Poisoned bait is most effective if the land is free from young plants at the time, and may be used as a precautionary measure previous to planting, if the land is known to be or judged likely to be infested.

Stem Borer (*Phthorimœa heliopa*, Lwr.), Plates III. and IV.—The adult form of this pest is a small moth measuring about half an inch across the extended wings. It is closely allied to and much resembles the moth of the Tobacco Miner, but may be distinguished by its yellower coloration.

The female moth lays her eggs singly on the leaves or elsewhere on the plants, and these hatch during the summer in about a week. The newly hatched larvæ have been observed to bore into the nearest part of the plant, and this is frequently the leaf tissue. These preliminary mines, however, are usually vacated very quickly, some being only about quarter inch in length, others up to one inch. The larvæ also mine into the midribs, and may possibly work their way thence into the stem. The favourite point of entry into the stem seems, however, to be close to the base of the leaf petiole under the bud. The presence of the larva in the stem causes a swelling to form, and, if the plant is a seedling, the growth ceases above the swelling and suckers are put out from beneath. When full grown the larva prepares an exit hole in the side of the gall, leaving the thin epidermis still intact, and changes to the pupa or chrysalis stage with its head facing the exit, the pupa being held in position with web. Moths bred through from egg to adult at Salisbury emerged in from sixty-one days after the first eggs were noted, or from sixty-four after the parent moths were confined with the growing plants. In this way eggs laid in the seedbeds in October produce moths in December, and two more generations follow in the field, moths from the last one appearing in May or June. The broods, however, are evidently quite irregular, moths emerging throughout the year.

It may be mentioned that no food-plants other than tobacco have as yet been discovered in this Territory, but such must occur, as the insect is obviously native to Africa. It has also been noted as a tobacco pest in India. Loss in this Territory seems mainly to be due to infestation of the seedbeds, but damage also occurs in the field, and if infested seedlings are planted out the loss from field infestation may be considerable. Heavy loss in the field appears, however, more or less confined to dry seasons, and the same phenomenon has been noted in India.

Control.—Moth-proof seedbeds must of course take first place in preventing attack. Regular spraying with an arsenical compound as recommended against cutworms is also likely to act as a check. The destruction of all tobacco plants in the field after the crop is harvested is beneficial in stopping breeding over the winter. In this connection attention should also be paid to volunteer plants springing up around the homestead, curing barns and elsewhere. Finally, infested seedlings should never be planted out, for not only are they useless, but they breed moths to attack other plants in the field. The swelling under the bud is easily noted, and should cause the immediate destruction of the plant by fire.

Remedial measures are hardly practicable, as by the time the presence of the insect is apparent, through the swelling of the stem, the damage is done. It has been stated, however, that the severance of the

stem below the swelling and removal of all but the strongest sucker may result in a certain amount of useful leaf being produced. Whether this is carried out or not infested plants should not be left untouched in the field, and if the season is too far advanced to replace the plant with a healthy seedling, the former should either be treated as above or burnt.

Tobacco Miner or Splitworm (*Phthorimæa operculella*, Zell.), Plate IV., Figs. 1, 3 and 4.—This insect is closely related to the preceding, but the moth is darker coloured. The larvæ are similar, but the present pest chiefly attacks the leaves, and although found in the stems, is not known to produce any swelling. The "Splitworm" is the same species as the well-known "Potato Tuber-Moth," which bores into potato tubers in the store and in the ground, and also mines the leaves and stems of the plants, as in the case of tobacco.

The female moth lays her eggs singly on the plant. The eggs hatch in from six to ten days, and the young larvæ eat into the tissues. They eat out the substance of the leaf in irregular patches, leaving only the upper and lower skins. These patches are translucent when the leaf is held up to the light, and the caterpillars may commonly be seen inside the leaf (see Plate IV., Fig. 4). When full fed the larva spins a cocoon and changes to a pupa either within or outside the plant, the moth under favourable conditions emerging from 35 days after the hatching of the egg. The period of development, however, is affected by the temperature, and possibly the food. The figures given above were obtained from specimens bred in potato tubers; development in the leaf tissue of tobacco may possibly take somewhat longer. The important point is that several broods occur during the growing season, so that the pest increases rapidly in the field. One larva killed in December is likely therefore to prevent the development of a considerable number by April or May.

As tobacco is not at present grown for the purpose of making cigar wrappers in Southern Rhodesia, the injury to the leaves is not of the same importance as it is in some other tobacco-growing countries. The lower leaves of the plants are chiefly attacked, and where "priming" is carried out, many of the infested leaves are removed. Much good leaf is, however, liable to attack, and it is no uncommon sight in the barn to see hundreds of the caterpillars hanging by threads from the drying leaves, or crawling rapidly over the ground in endeavours to escape the uncomfortable heat.

Control.—Keep the seedbeds in as moth-proof condition as possible, and spray with arsenate of lead as recommended under "cutworm." Root out and destroy all weeds related to tobacco near the lands. These include the well-known "thornapple" or "stinkblaar" (*Datura stramonium*), the "False Cape Gooseberry," and others. Do not grow early potatoes or store potato tubers close to tobacco lands.

All "primings" should be destroyed at once by fire or burying deeply. If they are left on the ground the heat of the sun will cause the larvæ to leave them and seek the plants again. Infested leaves should be picked off and destroyed whenever practicable. In America labourers are sometimes sent through the lands to crush the caterpillars in the leaves by hand, and it is stated that this can be done fairly rapidly.


E. segetis. Male. 1.
E. segetis. Female. 2.
E. longidentifera. Male. 3.
E. longidentifera. Female. 4.
E. spinifera. Male. 5.
E. spinifera. Female. 6.
A. ypsilon. Male. 7.
A. ypsilon. Female. 8.

Plate I.

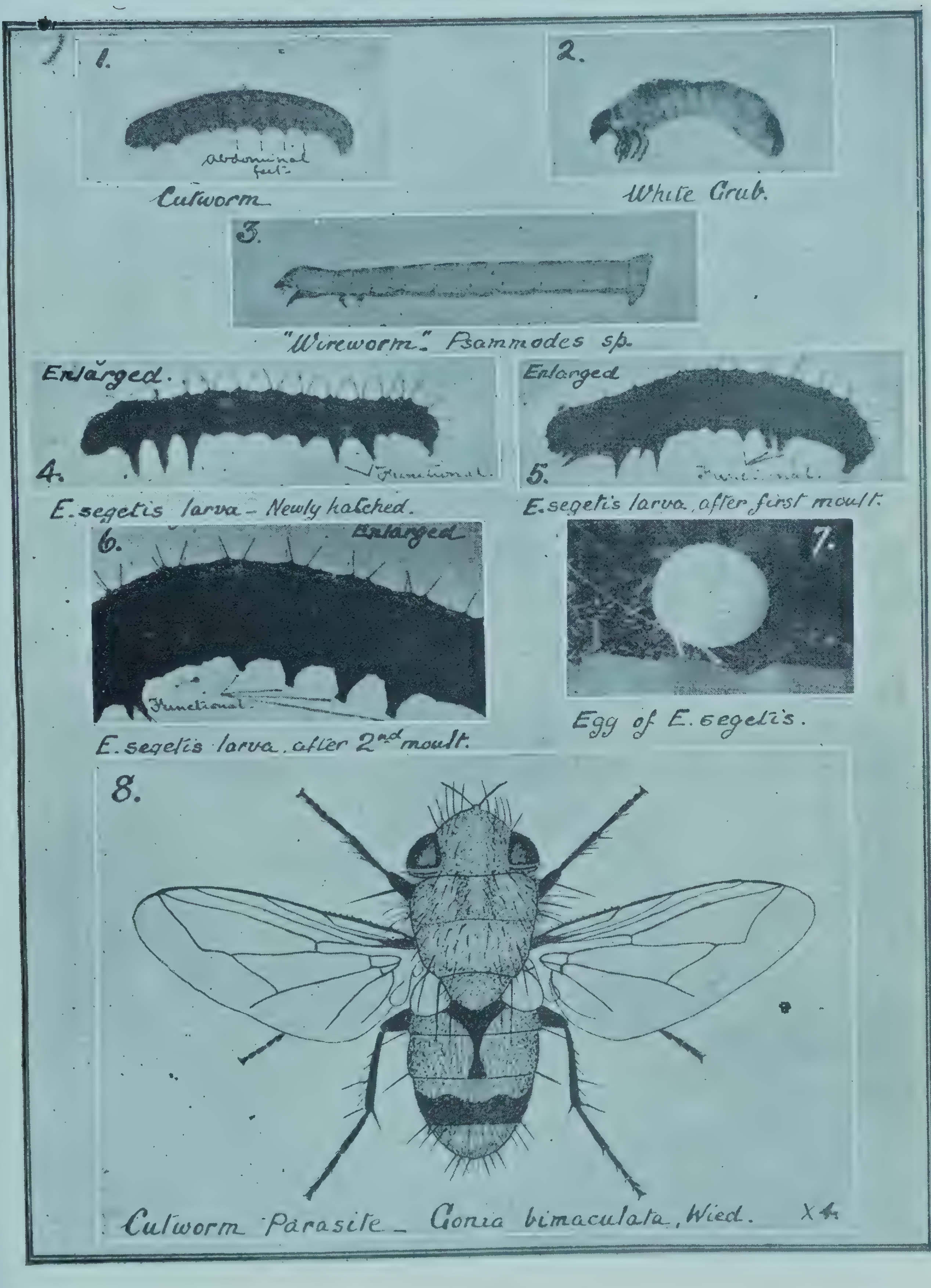
1.
abdominal feet
Cutworm
2.
White Grub.
3.
"Wireworm." Psammodes sp.
Enlarged.
4.
Functional.
E. segetis larva - Newly hatched.
Enlarged
5.
Functional.
E. segetis larva, after first moult.
6.
Enlarged
Functional
E. segetis larva, after 2nd moult.
7.
Egg of E. segetis.
8.
Cutworm Parasite - Gonia bimaculata, Wied.
x4

Plate II.

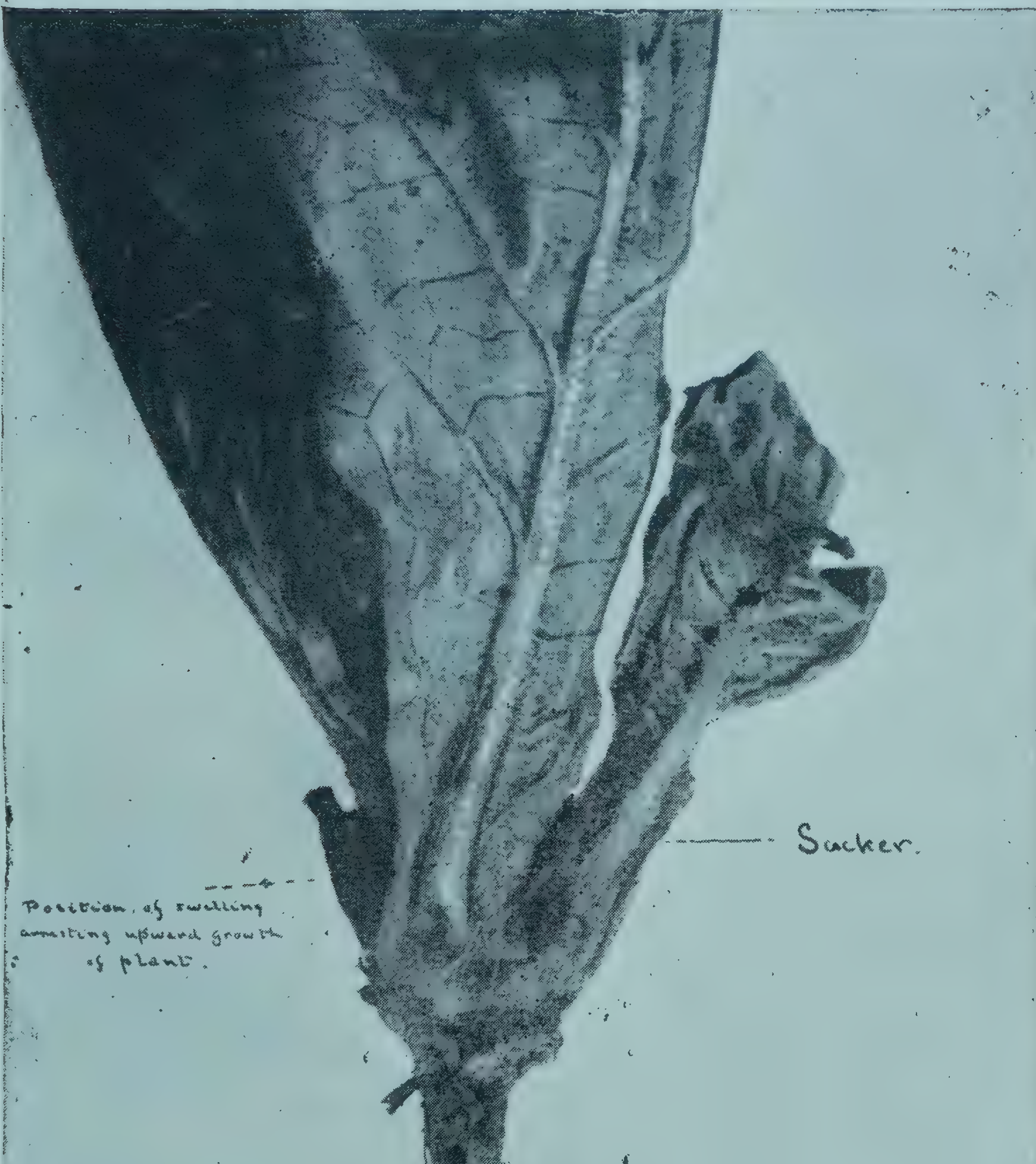
Sucker.
Position of swelling arresting upward growth of plant.
Tobacco Plant Injured by Stem Borer.

Plate III.

This would doubtless be economically sound where the leaves are destined for wrappers.

Tobacco Budworm (*Chloridea obsoleta*), Plate V., Figs. 1, 2 and 3. —This cosmopolitan insect has received a variety of names in connection with its attack on different crops. It is the "Cotton Bollworm" of the cotton belt of America, the "Earworm" of maize and the "Fruit Worm" of tomatoes. It appears to be an annual pest of tobacco in this Territory, as elsewhere, being worse some seasons than others.

The eggs are laid on the heart, or later on the seed heads, of the plant, and hatch in three to five days. The caterpillars eat into the unfolding leaves. Later in the season they attack the seed-pods. The caterpillars vary in colour from pale green to various shades of brown, and may be quite plain or ornamented with stripes. Large specimens reach a length of nearly 1½ inches. When full fed the caterpillar enters the ground to pupate, emerging as a moth in from 17 to 27 days in the summer. Moths pupating late in March frequently over-winter as pupæ, emerging in October, but another brood of moths commonly occurs in April and May. In one instance, out of six caterpillars which pupated in April, two moths emerged in May and four the following October and November. The broods are therefore not altogether regular, although the over-wintering brood appears more or less regularly in October and November. The full life cycle of this insect has not as yet been followed in this Territory, but it has been worked out very carefully in the Southern United States, where the development from egg to adult has been found to occupy slightly over a month at midsummer, and from six to eight weeks in the spring and autumn.* It is probable that four or five complete broods mature in this Territory during the year.

Control.—The pupæ in the soil during the winter are within reach of the plough, and if land admits of the clods being broken up, as is usually the case with tobacco lands, winter ploughing, harrowing and rolling should do much to break up the pupa cells and crush or expose the pupæ. These operations must, of course, be carried out before October.

The usual practice in this Territory is to destroy the caterpillars by hand. Frequently this only needs to be done once, namely, during "topping" operations, but in bad years cases have occurred when the entire staff of natives has had to be utilised to save the crop.

Paris green and slaked lime, flour or finely ground maize meal in the proportion of half a teaspoonful in a quart is recommended as a cure for bud injury in the United States, but it sometimes burns the plants, and is likely to be superseded by powdered arsenate of lead. This would need to be used at a greater strength, say about one tablespoonful to a quart of lime, flour or meal. The mixture is applied to the buds in the powder form by means of a tin perforated like a pepper canister, or the powder can be tied up in a piece of sacking and jarred over the plants. By fastening two pieces of sacking on a stick the width of a row apart, two rows can be treated simultaneously. Dusting the seed heads which are required for seed is also a good practice.

*E. Dwight Sanderson: Insect Pests of Farm, Garden and Orchard.

Other Caterpillars.—Tobacco is sometimes attacked in the seedbeds by the Pigweed Caterpillar (*Laphygma exigua*, Hübn.), Plate V., Figs. 6 and 7, and by the Tomato Caterpillar (*Prodenia litura*, Fb.), Plate V., Figs. 4 and 5, the former being the commoner pest. *L. exigua* may also prove injurious in the field. Both these insects are rapid breeders, passing through several generations during the year. The eggs are laid in clumps on the food-plants and hatch in a few days. The caterpillars feed upon the foliage and even the stems of the plants, those of *P. litura* having something of the habits of cutworms, lying hidden at the base of the plant during the heat of the day and feeding at night. Both species pupate in the soil. The moths are nocturnal in habit.

Control measures lie in keeping the seedbeds as moth-proof as possible, combined with spraying, as already recommended. Bad attack in the field should be met by spraying with either arsenate of lead (paste) 1 lb.—16 gallons, or (powder) 1 lb.—30 gallons. Paris green is largely used for spraying the crop in America, but lime should be added to check burning. One quarter pound of Paris green plus half a pound of fresh lime to 40 gallons of water are the proportions recommended. For applying the spray a knapsack pump fitted with a nozzle of the cyclone pattern is necessary. More than one is desirable if the acreage to be treated is at all extensive.

EXPLANATION OF PLATES.

Plate I.—Details on plate.

Plate II.—Details on plate.

Plate III.—Young tobacco plant injured by Stem Borer (*Phthorimæa heliopa*), shewing position of gall or swelling, and sucker formed from below point of injury.

Plate IV.—Fig. 1. *Phthorimæa operculella* moth ("Splitworm") magnified about three diameters. The hair-line beneath shews the actual wing expanse of the insect.

Fig. 2. *P. heliopa* moth ("Stem Borer"), same magnifications as Fig. 1.

Fig. 3. *P. operculella* larvæ ("Splitworms"), slightly enlarged; those of *P. heliopa* are similar.

Fig. 4. Portion of tobacco leaf mined by "Splitworm," shewing the insect inside the tissues of the leaf; natural size.

Fig. 5. Large cricket, natural size.

Plate V.—Fig. 1. Adult moth of *Chloridea obsoleta* ("Budworms"), natural size.

Figs. 2 and 3. Larvæ of *C. obsoleta* ("Budworms"), natural size.

Fig. 4. Adult moth of *Prodenia litura*, natural size.

Fig. 5. Larvæ of *P. litura*, natural size.

Fig. 6. Adult moth of *Laphygma exigua* ("Pigweed Caterpillar"), natural size.

Fig. 7. Larvæ of above on leaf, natural size.

(To be concluded.)

Native Superstitions in Matabeleland.

By B. M. Gough.

On the south side of the Matopo Hills is a cave, which is zealously guarded by the Matabele natives. It is situated at the base of a steep conical kopje of considerable height, which can be clearly seen from the Matopo-Antelope Road. As far as can be gathered, only a few white men have been able to make their way to this hill, and it is pretty certain that no European has ever gained admittance to the cave. This cave is, or was, the dwelling place of 'Mlimo; the greatest of all the native gods; and the Matabele held their rain dances and other mysterious ceremonies there.

In the days of Lobengula, the priests who acted as the medium between 'Mlimo and the people were a great power in the land; and it is said that the king himself sent food offerings to these men, requesting them to entreat the "Great-Great-One" on his behalf to send the rains. 'Mlimo was the god of the heavens, and his priests were not common witch-doctors, but high and mighty rain-makers. The office of chief priest was handed down from father to son, as this particular family was reputed to be specially selected by the great spirit himself.

If the natives had been regular in taking supplies of corn, meat and beer to the cave of 'Mlimo, the priests were pleased, and told the people to go in peace and to rest assured that rain would be sent very shortly, as the great god was satisfied with their offerings. On the other hand, when a drought was on the land, and the offerings were small owing to the poorness of the crops, the priests would state that 'Mlimo was very dissatisfied with the quantity of food the people were giving him, and that he would stop the rains from falling if they did not supply him better. This would cause the natives to give all they possibly could from their depleted stocks, and in this way the priests lived on the fat of the land, while the poor superstitious heathens almost starved.

It was an understood thing that if an animal was offered to 'Mlimo it had to be black in colour, for the spirit had a special fancy for black goats and black cattle. He would, however, sometimes ask for an ox of unusual colour or with horns of a particular length or shape, and when such an animal was wanted it had to be procured immediately. Needless to say, the priest had seen the special animal described in some native's herd, and the owner had to consider it a high honour to be able to supply the very ox the "Great-Great-One" wanted.

When an offering was made to 'Mlimo, it was deposited outside the mouth of his cave, and was conveyed into the presence of the almighty one by the "Ziwosana" or priests, while the people withdrew to a respectful distance. They would chant the praises of this great ruler of all things, and after many high-worded salutations, would introduce the question they desired to put to him. This was nearly always a query as to when the rains would fall, for the 'Mlimo was too great a god to worry over small things such as sickness or the loss of live stock, and these matters had to be referred to the spirits of their departed leaders. The high priest would act as spokesman between the people and the god; and after a suitable interval the answer would be given by the spirit himself. While he was meditating over his reply, the awaiting crowd would begin a dance, which grew faster and faster till the muscles of one native gave way, and he fell to the ground with them relaxing and contracting in a most extraordinary manner. The agility of one so afflicted was said to be marvellous, and the leaps he made into the air were quite beyond the powers of any person not specially under the spell of the great 'Mlimo himself. While the selected person was in this state the dance became faster, for this fit of frenzy was a sign that the great one was about to speak. A high state of excitement almost akin to hysteria was brought on by the dance, and the priests were careful to get the people highly strung, as the answer from 'Mlimo was, of course, a trick. When this answer was delivered, it seemed to be thrown out from many points, which went to prove that the great spirit was so powerful that he could be everywhere at the same moment. The "Ziwosana" practised ventriloquism, and this, aided by a strong echo thrown out by the cave, made it very easy for them to deceive the natives completely. This power of throwing the voice is brought out in a poem called "The Testing of 'Mlimo," by Cullen Gouldsbury, from which I will quote a few verses:—

"Then stood Benyu from the crowd,
Potent with the spirits he—
Stood erect and cried aloud,
While each tribesman's head was bowed:
''Mlimo! Lo, we list to thee;
Strike confusion on the proud;
Voice us thy decree!'

"Now it chanced a heifer grazed
Near the kopje, sleek and tame;
Swift she turned with head upraised,
Pawed the ground, her eyeballs blazed;
From her throat the message came:
'Let the God be praised!'

"Then again the witchman stood,
High upon a bevelled stone,
Crying, 'Once the test is good!'
From a stunted belt of wood
Came 'Mlimo's answering tone
Clear, and clearly understood:
'I am God alone!'

"Once again old Benyu cried;
Came the answer clear and soft,
From a boulder perched aloft
On the kopje's rugged side:
'Men, your faith, despised so oft,
Shall be justified!'"

The old natives state that when first the white men came to this country 'Mlimo was going to drive them away. He got very angry because some of the young people went with a white missionary to worship the white people's God, and his indignation was such that he left his cave and went far away himself. The very old men believe that he will return again, and to assist him on his return journey little round huts have been built on the tops of the granite hills, and in these huts the favourite foods of the great spirit are placed.

The true reason of his disappearance is that at the time of the Matabele rebellion the priests of 'Mlimo were the centre of a lot of trouble in the country. They had gained great power, and hundreds of natives flocked to arms around them in the Matopo Hills. An account of the fighting that followed is not within the scope of this article; suffice it to say, most of the priests were either put to flight or killed by the troops of the B.S.A. Company, and when they vanished, it of course followed that the god never spoke again. To this day natives spring up who declare themselves messengers of the great 'Mlimo; and attempts have been made to reinstate the god in his cave, but these attempts have failed most ignominiously. The priests of 'Mlimo can therefore be put aside as figures of the past; but their brothers, the bone-throwing witch-doctors, are still active factors in the land, although they are not allowed to carry on under British rule in the way they did in the days of Lobengula. While he reigned, they were the dominating power among the people, and were the real instruments by which he held sway over the Matabele nation. In the grounds of Government House, Bulawayo, the tree is still to be seen under which this blood-thirsty native king sat, while the bone-throwing and smellings-out ceremonies were gone through by his witchmen. If this tree could but speak, tales of hideous barbarism would be unfolded, which are almost beyond the conception of a civilised mind.

When a man (or woman) is selected by the "doctor" to enter the bone-throwing profession, he is given a potion which makes him very ill, and causes him to shout out in delirium that the spirits of the departed are conversing with him and telling him of future events. When such a case occurs, the elders call in the chief medicine-man, and a great consultation is held. After the patient has been examined by the old witch-doctor, he declares that the spirits of the departed are using their brother as a medium for expressing their wishes to the members of the tribe, and orders an ox to be killed as a peace offering to these spirits. A sort of religious meeting or feast is then held; and the afflicted person will come to his normal condition shortly after. He is now a marked man for high honours, and the witch-doctor obtains several sacred herbs and steeps them in a bowl of water. This mixture is stirred vigorously with a stick, until a white head of froth forms on the top of the liquid.

When an offering was made to 'Mlimo, it was deposited outside the mouth of his cave, and was conveyed into the presence of the almighty one by the "Ziwosana" or priests, while the people withdrew to a respectful distance. They would chant the praises of this great ruler of all things, and after many high-worded salutations, would introduce the question they desired to put to him. This was nearly always a query as to when the rains would fall, for the 'Mlimo was too great a god to worry over small things such as sickness or the loss of live stock, and these matters had to be referred to the spirits of their departed leaders. The high priest would act as spokesman between the people and the god; and after a suitable interval the answer would be given by the spirit himself. While he was meditating over his reply, the awaiting crowd would begin a dance, which grew faster and faster till the muscles of one native gave way, and he fell to the ground with them relaxing and contracting in a most extraordinary manner. The agility of one so afflicted was said to be marvellous, and the leaps he made into the air were quite beyond the powers of any person not specially under the spell of the great 'Mlimo himself. While the selected person was in this state the dance became faster, for this fit of frenzy was a sign that the great one was about to speak. A high state of excitement almost akin to hysteria was brought on by the dance, and the priests were careful to get the people highly strung, as the answer from 'Mlimo was, of course, a trick. When this answer was delivered, it seemed to be thrown out from many points, which went to prove that the great spirit was so powerful that he could be everywhere at the same moment. The "Ziwosana" practised ventriloquism, and this, aided by a strong echo thrown out by the cave, made it very easy for them to deceive the natives completely. This power of throwing the voice is brought out in a poem called "The Testing of 'Mlimo," by Cullen Gouldsbury, from which I will quote a few verses:—

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The head of the future doctor is anointed with this froth, and his body washed with the liquid from the bowl by the doctor, to the accompaniment of much hand-clapping and shouting from the onlookers. This ceremony completed, the candidate enters into a term of probation under the old witch-doctor, and spends a considerable time learning his art; after which he becomes a fully qualified medicine-man and practises on his own account.

The costume of a witch-doctor is a strange one, and each article of dress is said to have certain mysterious powers. On his head is a cap of monkey skin, which is supposed to relieve internal pains if dipped in the drinking water of the sufferer. Around his neck he has a string of roots, human teeth, small horns containing wonderful medicines, birds' feet and other curiosities. From the upper parts of his arms are hung pieces of dry flesh and strings of herbs, while the forearms are covered with rings of ivory and snake skins. Round his middle is a belt of cow hide, from which depends the dried inflated entrails of small animals; and in each of these small balloons a few loose pebbles are placed, which rattle as he moves his body. A pouch of leopard skin, suspended by a cord passing round the back of his neck, hangs near his waist; and in this he carries charms to ward off the attacks of lions, crocodiles and snakes; together with his all-powerful witch-bones. Around his hips is a string of animals' tails and beads of coloured glass; and his legs are adorned with rings of ox hide and brass. The whole costume consists of a collection of hideous or uncommon articles picked up by the doctor, which are supposed to have been sent to him by the spirits he is in league with.

When a member of the tribe falls ill, or cattle have been lost, the "induna" or head-man calls in the witch-doctor. A hut is prepared for him, in which is placed an ample supply of food and drink; and, while he is refreshing himself, all the inhabitants of the kraal gather around the hut in a large circle, singing his praises and clapping their hands. When he is ready to commence operations, the witch-doctor jumps into the open circle in front of the people. He glares at the natives out of his rolling eyes, and chews one of his strongest roots to bring on his powers of second sight. As he chews he sways his body, making a weird noise with his rattling charms. His movements become faster and faster, and presently he leaps and dances like one possessed by demons. He twists and turns in such a way that it seems almost as if his limbs will jump from their sockets, and his whole aspect is truly terrible. As he gets more and more excited, the perspiration pours from him, and when this stage is reached the people can hardly contain themselves, for it is a sign that the spirits are working within him. The doctor continues to leap about as if wrestling in deadly conflict with some unseen foe, symbolical of the fact that he is fighting the evil spirits; and carries on in a really frantic manner until he is tired out. He then gets calmer, but continues to sway his body as he starts his smelling-out business.

A great hush falls over the people at this stage, and the witchman speaks "There is witchcraft among you people?" says he.—"There is," they reply. "Somebody is smitten down in this kraal?"—"That is so." "An evil spirit has entered this person?"—"It is as you say." "The evil spirit was sent by one who wished him harm?"—"If you say so,

it is so." "It is your desire that I ask the good spirits to point out the worker of the evil charm?"—"It is! It is!" The whole of the assembly makes this last announcement with one voice, and a babble of excitement follows, as the witchman produces his bones.

A witch-doctor has more than one set of bones, and his lesser sets are a very miscellaneous collection of such things as lions' claws, monkeys' bones, shells, bucks' horns, stones and pieces of carved wood; but his most important bones are only four in number, and are usually made from the teeth of such animals as the hippopotamus and elephant. They are carved and grooved in a particular manner so that they can be easily distinguished one from the other. Each has a special name, and means a certain thing if it falls in a particular position, or with this or that side uppermost. A statement of the names and their meanings, or a description of the method of reading the bones after they have been thrown, is too long to enter into here.

Up to about twenty years ago the witch-doctor was a native of great power, and had an intimate knowledge of the affairs of all the natives in the kraals of his district. He never "smelt" out for nothing, but was well bribed for his trouble, and he, of course, never selected his victim at random. When a man was marked down for torture, he was someone whom the king wished to put out of the way, or a native who had grown rich in wives and cattle whom the indunas had decided to have smelt out, so that they could take possession of his wealth. After reading the story of the bones, the medicine-man would point out the selected individual as the worker of bad charms, and although this poor creature was quite innocent, he had to meet his death; for it was believed that, unless he died, the person he was said to have bewitched could not possibly recover.

In some cases the king would not sanction the death sentence, but would order the accused to be brought to his own kraal at Bulawayo. Here a second trial would be held by the chief of all the medicine-men, Lobengula's own witch-doctor, Zondo; and he, of course, found that an error had been made by the first witch-doctor, and the captive was liberated at the king's command. Such cases were not common, however, for all the witch-doctors played into each other's hands, and had a shrewd idea as to who were fit persons to select as victims. Given that the king gave his consent to the accused being put to death, the method usually followed was that of stretching him on the flat of his back upon the ground, and binding him to stout wooden pegs. A mixture was then spread over his body to attract the ants, and they would eat him. There were many other terrible deaths, such as roasting the victim on a bed of live coals, or pounding the body to a pulp by beating it with sticks from the legs upwards; but these are far too brutal to describe in detail. The people were savage by nature, and inflicted these terrible crimes out of sheer ignorance, for they thought they were doing the correct thing to put those in league with bad spirits to a painful death. "Horrible!" you may say. True; but many horrible things have been done by men to advance their faiths, and it is not so very many years ago that white men tortured and killed each other in the name of religion, so do not be too hard in judging these poor savages.

I cannot finish this article better than by once more quoting Cullen Gouldsbury :—

"White man, cease from your tales. Your God may be good for you,
But think you that aught avails to fashion *our* creed anew?
We, who are born and bred in the fear of 'Mlimo's wrath,
Heirs to eternal dread, shall we cast our witchmen forth
To take as a load instead the creed of ye from the north?

"Lo, we are born in the fear of wild and unspeakable things,
Born in the bushland here, where the souls of the dead have wings,
Hovering high in the air when the shades of even fall,
Shrieking in dim despair at the gate of each lonely kraal.
Scoff not, white man. Beware, when the ghosts of the dead men call.

"White man, laugh if you will! Such tales are for babes, you say?
Have you no god of ill? Do you not cringe and pray,
Offering sacrifice in a temple built of stone?
Do you not seek advice from a priestman of your own?
Do you not pay a price? Are *we* the heathen alone?"

The South African Farm News, Exchange and Mart.

We welcome this addition to the agricultural literature of South Africa. The "Farm News," which is a monthly publication, is published in Johannesburg, and the two numbers which have reached us contain much information of value to the practical farmer. The general get-up is very creditable, and we feel sure that the publication will have a wide circulation.

Poultry Husbandry.

BREEDING AND SELECTION FOR INCREASED EGG PRODUCTION.

By A. LITTLE, Poultry Expert.

The breeding season in Rhodesia commences in March, and the first chicks should be hatched in April. Those hatched in April, May and the first half of June are going to produce eggs the following autumn, when the older birds are going into moult; those hatched during the second half of June, in July and August, are going to do so the following winter, but those hatched after, at the latest the middle of September, will not commence laying as a rule till the following spring, when any bird will lay; moreover they have to be fed for 9 or 10 months before they commence to add their quota to the egg basket. Further, chicks hatched after the middle of September are more difficult to rear and require more care, for the reason that the heat and then the wet season catches them when quite young, and handicaps them in their early stages and prevents good growth; they develop into stunted weedy birds that are always unprofitable. Such being the case, it behoves farmers and poultry keepers to see to it that they are quite prepared to commence hatching towards the end of March, and the main thing is to decide well in advance upon the birds which are to be the parents of those which are going to produce a large number of eggs all the year round. Every bird, no matter whether it is pure-bred, a first cross or a mongrel, has certain points, anatomical and otherwise, by which we can put it in the category of a good layer, a medium layer or a bad layer. The same applies to the male bird as a breeder of layers, and further certain points which can be seen and felt in the bird denote the most important qualities of strength, vigour and stamina. From the present to the period when the breeding season commences, poultry keepers should go carefully over their birds to decide upon those which are the best layers to produce stock for future production of eggs in large quantities. A bird, no matter how well fed, housed and cared for, will not lay well unless she has the laying points well developed, neither will her progeny; and similarly a bird with good laying points will not produce eggs in large numbers unless she is well fed, housed and cared for. The first and most important point in breeding good layers is health; without it the future progeny are weak, stunted, difficult to rear and a prey to insects and disease and most unprofitable. Vigour, stamina and a strong constitution are most essential, not only to produce progeny with similar qualifications, but a bird without them cannot

stand the strain of laying a large number of eggs. Therefore in choosing your birds for future breeding select very carefully for these qualities. After you have selected your strongest, healthiest and most vigorous birds, go through these and select the very best layers from among them, even if among 100 you have only 10 very good ones. Use these as breeders rather than add 10 more that are medium, for it is much more profitable to have a smaller number of good layers than a large number of poor or medium ones. A good layer costs no more to feed and care for than does a poor one, and the profits are proportionately much greater.

Remember that the male bird plays a very important part in the production of good layers; in fact a more important part than the hens, for it is chiefly through him that the laying qualities are transmitted to the progeny, and these from his mother. Therefore, the cockerel chosen should be a son of your best layer, and the one from among her several sons who shews the following points in a marked degree:—Viciousness, one that is a good fighter, has a clear, full crow, who takes care of his hens and sees that they get their food, waiting till they have satisfied themselves before he has his own, and one that shows masculinity all over. Other good points in a breeder of good layers can be determined on handling him. These will be dealt with later in conjunction with similar ones to be found in all good layers.

The hens chosen for the production of good layers should be those that are off the roost early and return to it late, that are active and alert-looking, that are continually scratching and foraging for their food, that are deep in body from the back downwards, that are broad in the breast, full, deep and wide behind the legs, that stand firm and upright, with legs set well apart, short shanks and very little of the thighs showing. The poor layers are those that are dull and listless, that hang about the house and run, waiting to be fed, that have narrow cut-up breasts, long legs inclined to knock knees, and shew lack of depth of body and of development behind the legs. The tail too in a good layer and breeder of layers is always carried high.

By handling a bird the good qualities are more definitely determined.

The Head.—This should be small to medium in size, short, fairly broad, deep and round, the face short, clean looking and as free from wrinkles as possible.

The Beak should be short, broad at base and well arched, and inclined to that of the shape of a parrot's. The head and the beak should form a double curve. These points in the head and beak denote also strength, vigour and stamina; a long, flat, narrow head and beak denote the reverse. Therefore a bird with these defects should not be chosen if it is desired to breed strong, vigorous birds and good layers.

The Eye must be large, round, bright and prominent, and free from drooping lid and heavy, overhanging eyebrow; the eyes should also project well from the skull. A dull, sunken, sleepy-looking, almond-shaped eye must be avoided.

The Comb in both sexes should be small to medium in size; heavy, beefy combs are *not* desirable for the objects in view. In the females the

texture of it and the wattles should be fine, smooth and soft, and feel like silk, whereas in the cocks a little roughness, but not coarseness, is necessary, as it denotes vigour and therefore stronger chicks. These in both sexes, as well as the face, should be of a bright red colour.

The Breast, as noted above, should in both sexes be full, broad and deep. This is necessary to give full expansion to the lungs, which enables the bird to inhale the maximum of fresh air (oxygen), and so ensure health and vigour. A narrow, cut-up breast means poor layers and weak chicks.

The Back should be as long and as broad as possible, and very wide across the wings. The following measurements across the back at its widest part are a good guide :—

	Heavy breed, male.	Light breed, male.
Very good	8 inches	7 inches.
Good	6 inches	5½ inches.
Poor	4½ inches	4 inches.
	Female.	Female.
Very good	6 inches	5½ inches.
Good	5 inches	4½ inches.
Poor	4 inches	3 inches.

The back too should be flat; a narrow, rounded back or one sloping on each side from the back bone, leaving a ridge which can be felt when the outspread hand is placed on it, denotes lack of vigour and stamina, while fewer eggs may be expected, and in the progeny poorer layers and weaker birds.

The Saddle Hackle Feathers in the male are the long, thin-pointed ones falling down each side of the back near the root of the tail. These must be noted, as the longer and more numerous they are the greater the vigour, stamina and constitution the bird has.

The Breast Bone should be short, three and three-quarters to four inches in the female and half an inch to one inch longer in the male.

The Abdomen, the part under the tail and behind the legs, should especially in the female be wide, deep and full. Here are situated the egg organs, which with the eggs require ample space for development, and in this region there should be no superfluous fat. Taken in the hand it should not feel like a bladder of lard, but like the flesh between the finger and thumb of one hand when grasped with those of the other.

Under the section for the abdomen comes one of the most important points, *i.e.*, the distance between the pelvic bones and that between the end of the breast-bone and one of the pelvic bones in the female, and in the male between the latter. But although this is probably the *most* important point, don't run away with the idea that it is the *only* necessary point in a good layer or good breeder of layers—such an error is frequently made; in selecting your birds you *must* do so on all the points here enumerated, and the bird with all or as nearly as possible all these is the one to choose for the purpose in view.

The ends of the pelvic bones are found just under and on each side of the "parson's nose"; the end of the breast bone is lower down and half way between the pelvic bones, the three forming a triangle with the end of the breast bone as the apex.

The following measurements for width between the pelvic bones in the female only as noted above are a good guide:—

Very good	$2\frac{1}{2}$ inches.
Good	$1\frac{1}{2}$ inches.
Poor	$\frac{3}{4}$ inch.

Occasionally birds measure more than $2\frac{1}{2}$ inches, and these, provided their other points are good, should be bred from as long as they will produce fertile eggs, as well as those measuring $2\frac{1}{2}$ inches; those measuring $1\frac{1}{2}$ inches should be kept only to produce eggs for eating or for market, those $\frac{3}{4}$ inch or less should be got rid of at once, for they are not profitable and never will be. It is well to remember that when a bird is not laying for some reason or other, for instance, moulting, illness, etc., the pelvic bones are closer, and this must be allowed for; also if the bones are thin, elastic and straight, the bird possessing such pelvic bones is a better layer than the one whose bones are curved inwards, thick, hard and rigid. With reference to the distance between the end of the breast bone and one of the pelvic bones, the following measurements will act as a guide:—

	Male.	Female.
Very good	2 inches	4 inches.
Good	1 inch	$2\frac{1}{2}$ inches.
Poor	$\frac{1}{2}$ inch	1 inch

Again the same applies here, *i.e.*, that those birds which are put in the category of very good, provided other points are also very good, should be used for breeding from, and those that shew poor points in this respect should be killed off.

Such is the method of selecting the best layers and the best breeders of layers for the production of future good layers and profitable stock. These are first grade birds. Those birds not good enough for this purpose, but good enough for producing eggs for market or for use in the house, come into the second grade. Thirdly, those birds termed drones, which do not lay sufficient eggs to pay for their keep, should be killed or sold for killing without delay.

By following the above procedure each year, the farmer or poultry keeper will in a very short time have *only* on his place strong, vigorous, healthy, profitable birds producing large numbers of eggs, each one adding materially to the income of its owner.

Shorthorns.

THE SHANGANI STUD HERD.

By C. D. Wise, F.S.I.

The following description of the breed, which is published by the Shorthorn Society of Great Britain and Ireland, will be of interest to those who have not already seen it.

"The breed is distinguished by its symmetrical proportions, and by its great bulk on a comparatively small frame. The head of the male animal is somewhat short, broad across the forehead, but gradually tapering to the nose; it should shew strength and masculine character; the nostrils full and prominent, the nose itself of a rich flesh colour; eyes bright, prominent and placid. The head, crowned with curved and rather flat horns (usually short in comparison with other British breeds), is well set into a lengthy, broad, muscular neck; the chest wide, deep and projecting; shoulders fine, oblique and well formed into the chine; fore-legs short and wide apart, with the upper arm large and powerful; barrel round, deep and well ribbed up towards the loins and hips, which should be wide and level; back straight from the shoulders to the setting of the tail; the hind quarters lengthy, but well filled up; the hair plentiful, soft and mossy, with a hide not too thin, and having a fine and mellow touch.

"The female has nearly all the same characteristics as the above, with the exception of the head being finer, longer and more tapering; the neck thinner and altogether lighter; and the shoulders more inclined to narrow towards the chine. The udder should be square and full, and the teats placed wide apart."

As regards the meat capability of the Shorthorn, the statistics from the Smithfield Shows of 1915-16 are of interest:—

	1915.	1916.
Shorthorns	1,594 lbs.	1,639 lbs.
Sussex	1,579 ,,	1,603 ,,
Hereford	1,559 ,,	1,533 ,,
Aberdeen Angus	1,530 ,,	1,486 ,,
Devon	1,505 ,,	1,418 ,,
Galloway	1,476 ,,	1,295 ,,
Welsh	1,439 ,,	1,420 ,,
Red Polled	1,393 ,,	1,422 ,,

The championship in 1915 for the best animal of any breed or sex in the cattle classes was awarded to a Shorthorn heifer weighing 1,794 lbs. at the age of two years, nine months and three weeks.

The following returns in milk yield classes of different breeds, shewing the average number of points of the first and second prize winners, were given at the Royal Show in England in 1916:—

Shorthorn	83.07
Lincoln Red	75.32
Jersey	74.78
Holstein-Friesian	74.09
Ayrshire	71.70
Red Poll	71.33
Guernsey	64.35
Dexter	57.35
Kerry	54.08

In the butter test competition at the same show the highest number of points awarded to each breed for cows over 900 lbs. live weight were as follows:—

Shorthorn	55.00
Jersey	41.20
Lincoln Red	40.70
South Devon	30.50
Guernsey	32.45
Holstein-Friesian	31.05
Devon	28.90

The above statistics prove that the breed is undoubtedly a dual purpose one. In breeding for beef, it is, however, important to bear in mind that the dams have to rear their calves, *i.e.*, they must be milkers to such an extent, and at the same time be meat producers. If the dam has not enough milk to rear her calf, the calf will never grow out really well.

The following description, in the *Shorthorn World*, of Mr. William Duthie's herd is of interest:—"At Collynie and Tillycairn the cows are deep milkers, as shewn by the strong lusty calves in his stalls, but he has not permitted this feature to detract from the meat-producing ability of his herd."

The colour includes dark and bright red, roan and white. The favourite colour is probably roan. White bulls are favoured for mating with red cows, and so producing the roan. For dual purposes and crossing with other breeds, having good bone, size and hardiness, the Shorthorn is hard to beat.

The B.S.A. Company has established during the past five years a Shorthorn herd at Shangani, and a few particulars will be of interest. The estate is situated on the western side of the railway, and the homestead is six miles from Shangani Station. The photograph which accompanies this article depicts the winning group of Shorthorns at the Bulawayo Show of 1919. The comment of the judge on this group was, "the finest group of Shorthorns he had ever seen." The white heifer "Shangani Lune," and the yearling bull "Shangani Exile," standing

B.S.A. Co.'s Shangani Estate Shorthorn Family Group. Open Championships at Bulawayo and Salisbury Shows, 1919, in Group Class.

next to her, were both bred on the estate from imported dams. The bull "Proud Patriot," $2\frac{1}{2}$ years old, on the left of the picture, the cow "Laura" and the heifer "Matilda," were all imported. The herd at Shangani now consists of over 250 head of pure-bred and registered animals, of which 130 animals have been imported from England. It is a fine foundation herd, and given sound judgment in management, with first class sires and proper feeding and attention, the resulting output of pure-bred bulls and females should be satisfactory. The following is the herd's record at the Bulawayo Show for the past three years:—

1917. 5 firsts, 2 reserve championships, 1 second, other awards 7.

1918. 3 firsts, 2 reserve championships, 6 seconds, 3 thirds, and reserve for champion group.

1919. 4 championships, 5 reserve championships, 4 firsts, 2 seconds, and 5 other awards.

The stud bulls now in use are:—"Prince Worcester," bred by Mr. James Horlick, imported by Mr. G. C. Woodforde. This bull is full of the "Barrington" blood.

"Roan Victor," bred by the late Sir J. Sivewright, imported 1916. This bull is of the famous "Orange Blossom" family.

"Aldsworth Jester," bred by Mr. W. T. Garne. A most impressive sire. Imported 1917, his grandsire being the well-known bull "Bampton Crown."

"Chief Justice," bred by Mr. Jas. Durno, of Tarves, Aberdeenshire, his sire being "Collynie Chief," bred by Mr. William Duthie. Imported 1918.

"Proud Patriot," bred by Mr. J. H. Toppin. Imported 1918.

"Ali Baba," bred by Mr. W. M. Scott. This bull is descended from the celebrated "Gipsy Girl" and "Goldie" families. Imported 1919.

"Latton Adjutant," bred by Mr. Sydney Dennis. This bull is of the "Lady" family. Imported 1919.

Too great stress cannot be laid on the selection of stud bulls and in mating these with the right stamp of cow. The man who excels in these particulars is a genius in his particular business, and his knowledge can only be acquired after years of careful study and the closest attention to details—in fact, he must live for it. In this country a breeder is somewhat at a disadvantage in that he is not in the swim, so to speak, with the home breeders who supply the foundation stock of the world. Home breeders cull hard, realising the importance of breeding only the best, and do not hesitate to pay a high price for a stud bull which is the stamp of animal required. Breeding up to a particular idea is a fine art, but if the standard is right it is a paying proposition, and the right sire will, even if he is a high-priced animal such as the yearling Shorthorn bull "Cluny Proud Augustus," recently purchased by Mr. Duthie, of Collynie, for 4,000 guineas, prove a sound investment. A registered pedigree is not everything; a beast that has the registered pedigree in the book, and that pedigree evident to the eye of a judge, is the animal for the herd. The care and attention given to their pure-bred herds by the breeders in the Old Country is an object lesson. From

October to the following April or May the cattle are housed, practically eight months of the year. The greatest care is taken never to let an animal run down in condition, and more particularly the young stock. Especial care is taken with these at weaning, which is a critical time—in fact, it is the turning point in the animal's life, when bad management may turn a "flower" into a "weed."

In this country we are apt to be somewhat parochial in our ideas as to the class of stock we shall go in for. After all, Southern Rhodesia is a spacious territory, and it will be found that parts of the country are suitable for one breed and some for another. Shorthorns will do better in some parts; Herefords, Polled Angus and other fashionable breeds in others; so it has been found in the Old Country and the world over. The Shorthorn is undoubtedly the premier breed. The meat industry of the Argentine has been built up on Shorthorn blood.

The cattle industry in this country may be divided into headings:—

1. Breeding steers for sale to farmers who will fatten them: For those who have not the class of land for feeding out their steers.

2. Fattening steers: For those who have better class land and part under irrigation.

3. Dairying: For those within reasonable reach of markets for the sale of milk, cream and butter, and who have the class of land, such as described under paragraph 2, which will enable them to farm for their cattle.

4. Ranching: For those who can afford to take up large areas of suitable veld.

5. Breeding pedigree stock: Which requires good land, good accommodation, special management and a considerable amount of capital.

It is the duty of the breeder of pedigree stock, whatever the breed, to as far as is possible supply good hardy bulls, and it is the duty of the purchaser to look after them when he gets them to his farm. The better the class of animal, the greater care it deserves and should get. To fatten, dairy or breed pedigree cattle necessitates the growing of suitable crops for feed, more especially for the two last-named businesses. Are some of us not apt to forget this?

One final word of caution. Do not start with pedigree or dairy cattle until the farm is ready for them. Be assured you can grow winter feed, which after all in this country is required for a short period as compared with the winter in the Old Country. In the establishment of a herd, gradually work up, do not rush it, start right.

Fat Stock from Rhodesia.

The gratifying results achieved by Rhodesian cattle at the Fat Stock Show of the Witwatersrand Agricultural Society, held at Johannesburg on the 10th and 11th September, are well-known, and it will be of interest to give such particulars as are available in regard to the type of beast exhibited and the methods of feeding employed.

There were three exhibitors from Rhodesia—Messrs. C. S. Jobling and E. A. Hull from Matabeleland, and C. C. Macarthur from Mashonaland—each of whom has a lengthy experience of cattle breeding in this country and who ranks amongst our foremost stockmen.

The cattle sent down consisted of four lots, five in each, and these secured nine prizes worth £300 10s. These represent five firsts, three seconds and one third, one award being the championship for the best ox on the show.

Mr. Jobling's exhibits consisted of a pen of five grade Herefords, and with these he secured premier honours in the group of five Hereford grade slaughter oxen having not more than four pairs of permanent incisors; group of five slaughter oxen (open); best five oxen under five years; while two of his animals were placed first in the class for the best pair of Hereford (or grade) steers under four years. Truly a most creditable performance.

These steers of Mr. Jobling's were almost exactly three years old, although some had more teeth than others. They were the result of two crosses of pedigree Hereford bulls on Africander type of cows, *i.e.*, they were three-quarter bred, their grand-dams being Africanders. They were raised entirely under veld conditions, never having had anything but grass until put up to feed on 1st May. The feeding period was therefore 130 days, and they were fed entirely on produce grown on Mr. Jobling's farm Devonby, near Bulawayo. The animals were dehorned as calves, and Mr. Jobling is of opinion that this rendered them more placid in temperament. The average live weight at Johannesburg was 1,353 lbs. One of these beasts was awarded the reserve championship in the block test, and the remaining four were sold at an average price of £30 15s. In the block test the live weight of Mr. Jobling's Hereford was 1,410 lbs., and dressed 823 lbs., a percentage of 58.3. This bullock fetched £30 5s. We are pleased to be able to reproduce three photographs of these cattle, of which Mr. Jobling may well be proud.

Mr. E. A. Hull, of Matopo, sent down two pens of Lincoln Reds, there being five animals in each lot. With these he secured second place in the slaughter ox class having not more than one pair of permanent incisors; second in the group of five Shorthorn grade slaughter oxen; third in the group of five slaughter oxen; highly commended and reserve in the group of five slaughter oxen (open). The pen of five older

oxen were between three and four years of age, and the average live weight was 1,580 lbs. The average price realised on the sale was £34. The animals had been fed on an average for 90 days. The younger pen were two-year-olds, and they averaged 1,170 lbs. live weight. The average price realised for this lot was £24 10s. These steers had been fed for five months. In the older block test the bullock weighed alive 1,670 lbs., and dressed, 1,060 lbs., or 63.5 per cent. The younger bullock in the block test weighed alive 1,225 lbs., and dressed, 736 lbs., or 60 per cent. All these beasts were fed on ensilage, mealie meal, bean meal and veld hay.

Mr. C. C. Macarthur exhibited his pen of five Shorthorn grade bullocks which had beaten all-comers at Salisbury and taken second place at the Bulawayo Show. With these he took second place to Mr. Jobling's grade Herefords in the group of five slaughter oxen (open), while one of these animals secured the championship for the best ox on the show. The average live weight of these bullocks at Johannesburg was 1,667 lbs.

Our readers will, we are sure, join us in heartily congratulating these gentlemen upon their successes and accord them the credit deservedly due for the enterprise which produced such splendid results.

We also reproduce with these notes three photographs of the winning exhibits of maize sent from Rhodesia to the Maize Show. These were received too late for inclusion in our last issue.

Wild Dogs.

By W. E. M.

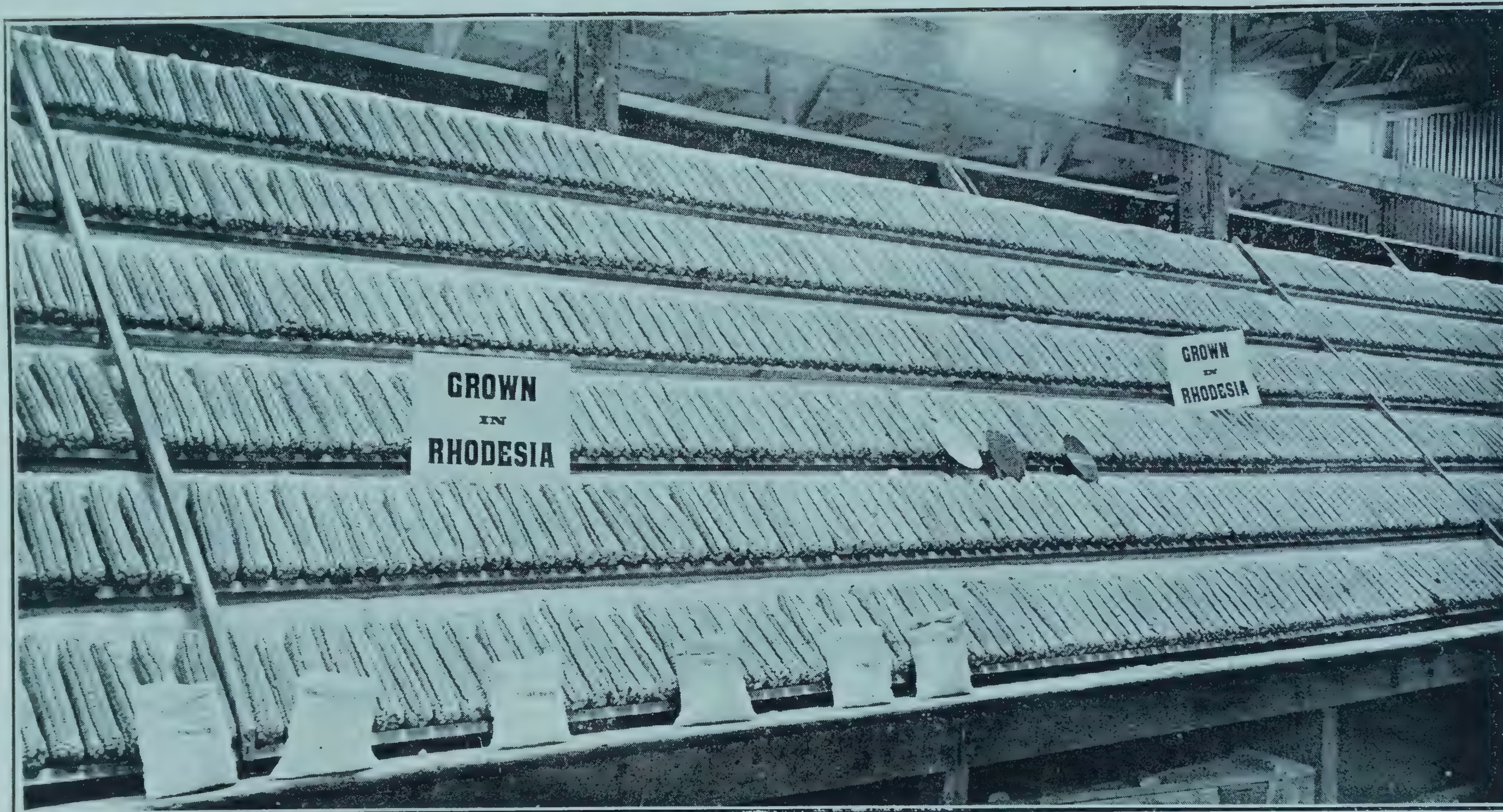
In certain districts of the Territory wild dogs are so numerous as to become a pest, and considerable losses of stock occur as a result of their depredations, amounting, it is estimated, to two or three thousand head of cattle each year and very many sheep. Hunting in packs, numbering sometimes a dozen or a score or more dogs, these big, powerful, wolflike brutes for the most part prey on the wild game, but as these become scarce they frequently turn their attention to domestic stock, exacting a toll which means a heavy loss to the unfortunate

Mr. C. S. Jobling's grade Herefords.

Best pair of Hereford (or grade) steers under 4 years, Witwatersrand Fat Stock Show, 10th September, 1919. Exhibited by Mr. C. S. Jobling, Bulawayo.

Mr. C. C. Macarthur's grade Shorthorn bullocks.

One of Mr. C. C. Macarthur's grade Shorthorns. Champion ox at Witwaters-rand Fat Stock Show, 10th September, 1919.



Johannesburg Show, 10th September, 1919. Grand Championship 500 ears Hickory King, exhibited by Mr. G. Rattray, Bindura.

Championship, Johannesburg Show, 10th September, 1919 : 200 ears any other variety (Louisiana), exhibited by Mr. G. Duthie, Concession.

Reserve Championship. 200 ears any other variety (Salisbury White), exhibited by Mr. C. Southey, Concession, at Johannesburg Show, 10th September, 1919.

individual whose farm is visited. These dogs seldom attack human beings, and usually they can be easily driven off.

The Administration is alive to the menace, and offers a reward for each dog destroyed. This does not appear to be so widely known as it should be, and we therefore insert it here for general information. Government Notice No. 201 of 1916 :—

> His Honour the Administrator in Council has been pleased to approve payment of a reward of five shillings for each wild dog destroyed whose destruction is reported and the reward claimed in the manner hereunder set forth.
>
> Rewards will be paid to Europeans by any Magistrate or Native Commissioner and to natives by any Native Commissioner within three months of the date upon which the animal is killed, on a solemn declaration in the form hereinunder prescribed.
>
> In proof of destruction, applicants for the reward will be required to produce and surrender the skin of the animal with the tail not severed.
>
> *Form of Declaration.*
>
> I,......................................, do solemnly and sincerely declare that I did, on the...........day of...................................., and not before, destroy.........wild dog(s) in the district of........................., within the boundaries of Southern Rhodesia, and that I am entitled to the reward offered by the Government, and I make this solemn declaration conscientiously believing the same to be true.
>
> ....
> Signature.
>
> Signed and declared at..............................this............day of
> ....
>
> Before me,
>
> ....
> Magistrate or Justice of the Peace.

Since 1916 to the present date rewards have been paid under this regulation on 436 wild dogs.

There is a wide-spread belief that natives from superstitious reasons are averse to the killing of these wild dogs, but the superstition is not so general as is thought. In some districts wild dogs are, as a matter of fact, regarded with favour, inasmuch as the natives are on occasions able to rescue and consume the meat of wild animals which the dogs have hunted down. They are only tolerated, however, so long as they do not attack the natives' own herds; when this happens the dogs are given short shrift.

The native superstitions are of interest and vary according to district. For instance, in the Melsetter district the belief is held that if a married person kills a dog dissension will arise among the members of the village to which the slayer belongs, and eventually they will be dispersed. If unmarried, the slayer is supposed to become a lunatic and a wanderer.

In the Belingwe district a drought is supposed to follow the killing

of wild dogs, while barrenness is the penalty for such an act in the Selukwe district. In the Gwelo district it is held that anyone who kills a dog will become infected with open sores and gradually pine away.

The fact that white men who have killed wild dogs have not come under the evil influences referred to is said to be shaking faith in these superstitions, and it would appear that a more general knowledge of the reward to be obtained by the destruction of wild dogs would have the effect of enlisting the services of natives in a more whole-hearted manner towards the extermination of the pest.

Owing to the wide range of these animals, which scour great tracts of country, appearing and disappearing rapidly, efforts to shoot or trap them are not successful. As they rarely leave their kill until it has been completely devoured, poisoning is seldom practicable, though where it has occasionally been carried out good results have followed. The best method yet tried has been to track the wild dogs down to their lairs underground in the breeding season, and dig them out, when a large number of adults and whelps can be got at the same time. In the open they are occasionally shot, but not in great numbers.

These notes have been compiled from information kindly furnished by Native Commissioners throughout the country and other sources.

Export of Cattle from the British Isles.

(The following bulletin is issued as leaflet No. 290 by the Board of Agriculture and Fisheries.)

THE CATTLE TESTING STATION, PIRBRIGHT.

Need for the Efficient Testing and Treatment of Animals.—The regulations of many colonies and foreign countries relating to the importation of live stock prescribe the examination of all imported animals with a view to the certification of the absence of certain diseases. The examination must be carried out in the country of origin, or in the country of destination, or in both countries. This fact points to the need for the thorough and reliable examination, before shipment, of all valuable animals to be exported from this country. Without such examination the stock are liable to become a total loss through rejection and slaughter in the importing country. If, for example, reliable test-

ing for tuberculosis could be guaranteed, trade should be much facilitated and increased, while great expense would be saved by the removal of the element of uncertainty and the consequent lowering of the rates of insurance. So far as the Union of South Africa is concerned, the law requires all cattle to pass the test at a Government testing station in the exporting country, unless such a station is not available. In return for this, however, very important concessions are made in the importing country to importers.

Another cause which acts as a deterrent to the export trade in valuable animals, especially where the trade is with tropical or sub-tropical countries, is that foreign breeders are loath to import susceptible pedigree animals when they are likely to come in contact with natural infection in the importing country itself. It is well known that considerable losses have occurred in this direction, and the question arises as to whether it is possible to render animals going to tropical and sub-tropical countries resistant to the diseases prevalent in those countries.

The Board's Cattle Testing Station.—The various considerations discussed above have led to the foundation by the Board of an official cattle testing station. This station is situated at Pirbright, Surrey, and has accommodation for 100 head of cattle. The work carried out at the station is, at present, confined to the testing of cattle for tuberculosis, and to the immunisation of cattle against red water. It is hoped, however, to provide further facilities if necessity arises, both as regards accommodation and as to the tests and immunisation.

It may be explained that the virus of tropical red water has been effectively maintained at the Board's Veterinary Laboratory for 14 years, and the strain has been reduced in virulence to the extent that it will cause few, if any, fatalities among the animals inoculated with it. When animals receive this virus they suffer from a more or less mild attack of the disease and recover without being seriously impaired in health. After recovery they are highly resistant to a second attack of the disease, whether an attempt is made to infect them by inoculation or whether they are exposed to natural infection. The time required for an animal to undergo the immunising process and be fit for shipment is from three weeks to a month. It is admitted by veterinarians and importers that animals which have been immunised before leaving England are highly resistant to red water when put to graze on infected areas. Through the instrumentality of the Veterinary Department of the Board several hundred animals have been immunised in the last few years and shipped to South Africa, Rhodesia, East Africa, Brazil and Argentina, and reports on these animals after landing in infected countries have been highly satisfactory.

Another disease, anaplasmosis, occurs in the same districts as red water, and was formerly confused with it. If an animal contracts the two diseases together the results are often fatal. There is a certain amount of evidence, however, to show that animals which have previously been immunised against red water have a better chance of recovering from anaplasmosis than animals not so immunised.

Fees.—A fee of £9 per head is charged for the tuberculin test, a fee of £3 per head for immunisation against red water, and a fee of £16

for the tuberculin test and immunisation combined. The fact that an animal has passed the tuberculin test or has been successfully immunised against red water will be certified under the seal of the Board. The fees include all charges for testing or immunisation, for food and attendance during the time required to carry out the operations, and for conveyance between the testing station and Brookwood Railway Station (L. & S.W. Railway).

Payment of fees is to be made prior to the despatch of an animal to the testing station, by cheque, or by postal or money order, payable to the order of the Board of Agriculture and Fisheries and crossed "Bank of England," and is to be forwarded to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W.1. A form to accompany the remittance will be furnished by the Board, when notifying an owner that an animal can be received at the station. The Board do not undertake to accept delivery of an animal until the fee for it has been received.

Conditions to be Observed by Owners.—Owners are responsible for the carriage of animals by rail to Brookwood Railway Station and thence after testing or immunisation to ports of embarkation.

Animals will be kept under observation at the testing station prior to the tuberculin test for 28 days, and an animal will be tested and available for removal after 31 days from the time of its arrival at the station, unless the test has to be postponed owing to some unforeseen circumstance. An animal received for immunisation only, will, in the ordinary course, be available for removal after 28 days. Where both operations are to be carried out the animal will have to be at the testing station for about 56 days. Animals should not be sent to the station for longer periods prior to shipment than will suffice for their being tested or immunised as the case may be. No animal will be accepted at the testing station for immunisation only unless satisfactory evidence is furnished that it is free from tuberculosis.

If an animal is kept for a longer period than is necessary at the testing station to suit the convenience of an owner, an additional charge at the rate of 40s. per week will be payable by the owner on demand by the Board, but if the excess period is owing to any unforeseen and unavoidable circumstances, this charge may be reduced by the Board.

Animals with respect to which certificates of immunisation have been issued are to be removed from Brookwood Station by rail, in sealed vans if required by the Board, direct to the port from which they are to be exported.

Applications for the testing or immunisation of cattle should be made at least a month before the date on which it is proposed to send the cattle to the cattle testing station. Forms of application can be obtained from the Secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W.1.

An undertaking is to be given that an animal which has been immunised will not be removed from the testing station except direct to the vessel on which it is to be exported.

The Board reserve power to refuse acceptance of an animal or at any

time to return to the owner an animal if its retention in the testing station is, in the opinion of the Board, undesirable from any cause.

Every animal sent to the testing station must be provided with a strong head-stall or halter, and notification is to be given in respect of any animal that has at any time proved to be vicious or dangerous.

Where more than one animal is consigned to the testing station by an owner, each animal is to be marked for the purpose of identification by affixing an ear-tag or otherwise.

The animals whilst under the charge of the Board will be under the care and supervision of their veterinary officers, but the Board will not be liable, nor will compensation be paid, for any loss occasioned by the death, slaughter, injury or illness of an animal, or by an accident to an animal, whilst under their charge or subsequently.

The Board reserve power, where they consider it to be necessary or desirable, to slaughter injured animals and dispose of their carcasses. The proceeds will be paid to the owner.

Should an animal react to the tuberculin test, it will be disposed of in accordance with the directions (if any) given by the owner on the application form. If no such directions have been given, the animal will be consigned at owner's risk and cost to the premises from which it was sent to the testing station.

For the purpose of identification every animal in respect of which a certificate is issued will be marked on the hoof or otherwise with a number by which the animal will be described on the certificate.

All communications should be addressed to the Secretary, Board of Agriculture and Fisheries, Whitehall Place, London, S.W.1, except notifications as to the time of arrival of animals. The latter should be sent direct to the Officer in Charge, the Cattle Testing Station, Pirbright, Surrey.

Note.—The Government of the United States of America employs its own agent in this country to test cattle before exportation.

Review.

"THE FARMER IN SOUTH AFRICA."

We have received for review a book published under the above title by Messrs. Maskew Miller, of Capetown (4/6), and written by Mr. P. J. du Toit, Under Secretary for Agriculture in the Union. We can with confidence recommend this book to the attention of all concerned in

the progress and prosperity of South African agriculture. The work, which has previously appeared as a series of articles, is, as the sub-title explains, really a series of thoughtful papers on farming problems in the sub-continent. As such it deserves consideration, especially since it comes from the pen of one who can claim an intimate knowledge of the subject, and who may be relied to deal with it sympathetically and impartially.

The subject is treated from two aspects—the social or personal, and the economic. Under the former head are chapters on the European and native races and the relationship each bears to the other, the South African farmer, and farmers' organisations for gain, education and propaganda. Under the latter are discussed taxation in its various aspects, markets, prices and the effect and inter-action of economic laws on the farm and extent of production by the farmer.

The author has made good use of the authoritative material at his disposal, and consequently his work is instructive and suggestive. For the purpose of clear description a style somewhat didactic has been adopted; on the other hand, much of the merit of the work lies in the simplicity with which the points are stated and explained. Thus he lays down (page 15) that "The farmer's duty to the State is to do the best he can for himself—to render service to the State through the individual." No qualifications are made to this assertion. Surely this is not the whole duty of man, even a farmer, to the State. The same might be said of an ox or an ass, but fortunately the South African farmer generally interprets his duty to the State somewhat more liberally, and does a little for others besides himself from a sense of public duty. We cannot also quite agree with the description of the South African farmer, "His conservatism is his salvation; it is also the salvation of the State."

Mr. du Toit has a good deal to say on markets. His views regarding demand and supply may well be quoted:—

"Markets are, therefore, selling places limited by the prices which the buyer is prepared or able to pay, and which the seller at the same time is prepared or able to accept. The extent to which the buyer is likely to meet the seller determines the extent to which the seller will meet the buyer, that is, to which the seller will grow a product which the buyer requires. The farmer will produce according to the market he has. He will not and cannot reasonably be expected to produce more, because he cannot in justice to himself and his dependants produce at a loss, or even at a less profit than that which he may deem to be a fair return for his expenditure of labour, of money, of implements, of seed and so forth. Greater market must, therefore, precede increased production."

Much information will be found in the chapters dealing with the effects of markets on production, from which we cull the following:—

"It was the reduction of the railway rate to the coast for export maize in 1907 that made the oversea market accessible to all the producers and gave the greatest impetus to maize cultivation. The industry was asthmatic until the export trade was established. The unlimited

European demand raised the price sufficiently to ensure the farmer a profitable return, and he responded. In 1904 the production was about 4,000,000 muids (200 lbs.), and in 1911 it was 8,632,516 muids. The estimate for 1915 was 10,250,000, and for 1916, when there was a great loss from drought, 7,056,000 muids."

The remarks made regarding tobacco do not, happily, apply to Rhodesia where, based on a good reputation, the demand exceeds present supplies and the prospects are bright. Of tobacco in the Union, Mr. du Toit writes:—

"This is another industry which is stunted, owing to its having a local market only. The quality of the product is improving, but the quantity produced is diminishing, notwithstanding a decline in imports. To what extent the recently-imposed excise has lessened consumption it is difficult to say, but that the consumption is less than it was admits of no doubt. Prices rose appreciably last year, and the effect of this must be to increase production again. Some special lines will probably also be cultivated more extensively. But until a market is found oversea, such fluctuations must continue to take place. The production in 1904 was 12,112,000 lbs., and in 1911 it was 14,961,000 lbs., while at present it is estimated to be not more than 10,000,000 lbs."

Taxation of farmers is a theme much under discussion of late in the Union. After indicating that direct taxation is preferable to indirect taxation and that income is the only common basis for taxation, Mr. du Toit states a case for and against a land tax so clearly that we must once more quote, as follows:—

"A land tax is not a fair tax if it is intended to take the place of an income tax. The taxation of the land in order to bring it into the market is another matter; it is not taxation of farmers, it is taxation of non-farmers. Anyone, even a farmer, who holds land which he does not use beneficially is, so far as that land is concerned, a speculator and not a farmer. A land tax for the purpose of obtaining a contribution from the farmer's income is a tax not according to the ability to pay of the individual in occupation, but a tax on the value of the land; not a tax on what the individual can pay, but on what it is arbitrarily considered he ought to be able to pay."

Although the book consists of a series of separate essays, yet in some measure each of these furnishes evidence leading to conclusions expressed in the last chapter which deals with the want of population. That the possibility of supporting in comfort a dense population is the truest test of the natural wealth of a country no one will dispute, and the ultimate aim of all political endeavour is, at least ostensibly, to achieve such a state of affairs. To this end Mr. du Toit urges that the need of South Africa at present is manufacturing industries which would increase the demand for raw products and also give occupation to some of the one hundred thousand poor whites for whom the farming industry does not seem to be able to find attractive employment. To increase the number of producers is, however, the author thinks, undesirable, as it would create greater competition without augmenting the number of consumers (page 78). According to this view and reasoning we conclude that more farmers are not wanted in the Union. With due deference to the logic

of the arguments we feel sure, at any rate so far as this country is concerned, that no Rhodesian farmer would endorse the conclusions reached. Quite apart from any industrial development, which would of course be welcome, we know that the more farms that are occupied, and the more grain, cattle and other products that are made available for market, the greater will be our national prosperity. The Rhodesian farmer does not fear the competition of his brother farmer. He realises that it is only by having large quantities of produce to offer that he can secure the best prices on the best markets and effect economies in reaching these markets, whether they be the mines and towns of the Territory, the tobacco factories at the coast or the buyers of maize in Europe. The laws of supply and demand may be inexorable, but it is common knowledge with us that good prices depend on our finding markets, and that there is little or no market for insignificant quantities. By increasing the number of farmers we expect to increase production. By increased production and the consequent assurance of ample regular supplies which result therefrom, we secure markets. By having large quantities to sell we have succeeded in opening up the Johannesburg market for our meat, and this has also made it possible to establish a canning factory at Odzi. Increased production will justify the handling of maize in bulk, the use of elevators and the provision of extra shipping facilities at Beira. Recognition for our grades of grain on the London Corn Exchange has been secured by the availability of adequate supplies. Capital to run butter factories has been attracted to this country for the same reason, and many other instances could be cited shewing that markets follow increased production.

Opinions may be divided, but a good may persons in the farming world of South Africa will be found to hold the view that there is still room for closer settlement, not only to the advantage of the settlers themselves, but also to the benefit of the original land owners who were there before them. Capital is too often unevenly distributed, too much being in the form of land and too little in livestock, tools, labour and improvements, and re-distribution can only be secured by division of the land and multiplication of the occupiers.

No one would dispute the obvious fact that the expansion of manufacturing industries would increase the farmers' local markets and "induce a proportionate increase in the rural population of South Africa," but we venture to question the soundness of the suggestion that we need fear an increase in the number of farmers. After all, the farmer adds to the wealth of the world in a way the manufacturer and artisan does not do. The latter by putting labour into raw material enhances its value, but the farmer in addition secures the co-operation in his work of the forces of nature, the eternal fertility of the soil, the blessed sunshine, the march of the seasons, the vital energy of plants and the physiological processes of live stock. The world in these days is a long way from suffering from over-production of foodstuffs, and is far from that critical point when further production must reduce the prices of farm products below a remunerative level.

E. A. N.

Correspondence.

VELD FIRES.

To the Editor,

Rhodesia Agricultural Journal.

Sir,

In venturing to make the following remarks *re* veld fires, I do so with some diffidence, but they are based on an experiment the Matopo Farmers' Association started four years ago, viz., the collecting of subscriptions amongst the white residents to enrol, pay and feed three native constables whose duty it is to patrol a certain defined area during the months of July, August, September and October. These special fire police are placed under the sole control and direction of the local N.C.O. at the B.S.A. Police Camp. The O.C. the B.S.A. Police in this district has freely and willingly given all the assistance in his power to make the experiment a success, and detailed as far as possible an equal number of native constables to work with and assist the special fire police during the four above-mentioned months.

The results, I think, have justified the expense, but that does not mean we have had no veld fires. We have had many. The moral effect, however, amongst the natives, of the vigilance, patrolling and enquiry that are constantly before their eyes has been a deterrent to wilful incendiarism. Also a considerable number of convictions have been obtained, which also has had a good effect.

Taking the conditions so favourable to veld fires prevailing in Matabeleland during the months of July, August, September and October, there will always be every year a grave danger of veld fires starting. Many such fires are the result of accident, carelessness or the acts of irresponsible native children and herd boys of six to ten years of age or thereabouts, and from whom no drastic penalty can be exacted even if caught. The aim should be, by educating public opinion, effort and organisation in each and every district, to concentrate on *extinguishing* veld fires. This often may seem a hopeless task, but much can be done to limit the damage and check the spread of these fires. Let all residents, both white and black, concentrate on extinguishing any veld fire burning within a radius of any homestead, store, kraal or habitation, and much can be done to limit this evil. Villages, towns, mines or other more thickly populated centres could and ought to make their own special arrangements for a given radius. Mine centres are a difficult problem, owing to the numbers of natives and the many varying tribes, to say nothing of the subsidiary industries attached thereto, such as wood-cutting, charcoal-burning, etc. The conditions prevailing in this district, however, must be common to many if not all districts in Rhodesia. There is a sparse and scattered white farming population,

a good deal of unoccupied land tenanted by a fairly numerous native population, a native reserve and some mines. One of the great difficulties we have met with is the fact that the natives will not turn out spontaneously to extinguish a veld fire, though there is a considerable body of public opinion amongst the older natives and stockowners, who see and feel the damage these fires cause. The reason they give is that if they are seen trying to extinguish a veld fire, or are in the near vicinity of such fire, they are arrested and taken to the Police Camp to be examined and questioned, and even if dismissed they are put to inconvenience, trouble and annoyance. Consequently they do nothing and clear away.

Many people attach great importance to burning "fire lines." My own experience is that the making of these "fire lines" is an arduous, expensive and difficult operation. All farmers do not employ a numerous staff of "boys," and on many occupied farms there are few (if any) native tenants. Briefly put, the objections to burning "fire lines" are that if such "fire lines" are burnt in (say) June or even July, many patches of veld will not burn—they are too green—other portions burn, but a green shoot of grass springs up, withers and in a month or so is a convenient "bridge" for any fire to cross, and that any feeling of security you may indulge in or build on as to the protection these so-called "fire lines" may afford you, is too often but a case of misplaced confidence. Should, however, you leave the burning of a "fire line" until the veld is all dry, you run a very grave risk of the fire getting out of control, with the final result of finding your own farm probably a smoky desert, and an angry controversy or action for damages from your neighbours to settle as best you can.

If the development of the stock industry is not to have continually recurring checks and be more or less permanently endangered, the only sound policy for all, both white and black residents, is to concentrate on *extinguishing* veld fires, making the catching and conviction of the culprit quite a secondary consideration. If a clause could be added to the Herbage Preservation Ordinance, making it an offence under the Ordinance for a veld fire to be found burning within (say) a radius of four miles of any homestead, store, kraal or other place of residence, without all hands, white and black, doing their best to extinguish such fire, it would stiffen and direct public opinion to cope with this evil and at the same time strengthen the hands of the special fire and other police forces, both in the extinguishing of the fire and the finding of the culprit who originated it.

The Matopo Association will, I am confident, go on with the special fire police, and I hope get better support from the residents; some are indifferent and subscribe little or not at all. It is well worth the expense. More support would mean that more police could be enrolled.

Yours, etc.,

WILLIAM LEES.

Alali Farm, Matopo,
24th October, 1919.

The Agricultural Outlook.

The dry season ended early in October, and good soaking rains have fallen in most parts of the Territory. Mashonaland has been more favoured than has Matabeleland, and as much as five and a half inches were recorded by the middle of November in the Salisbury district. The effect of a good downpour is reflected instantly in the appearance of the veld, and the countryside is now looking at its best, the all-pervading parched brownness having given way to a refreshing verdure.

The rainfall in parts of Matabeleland at the time of writing (20th November) has been meagre, and more rain is badly needed. Thunderstorms have been more than usually violent, and casualties are reported from certain districts. At a farm beyond Penhalonga 19 head of cattle were killed by lightning.

The critical time so far as Mashonaland is concerned is past, and cattle everywhere are rapidly picking up in condition. The past season has been a trying one in many parts of the Territory, owing to the prevalence of veld fires and to the fact that, notwithstanding a luxuriant growth, the grass did not retain its nutritive properties during the dry season so well as usual.

The subject of grass fires has been discussed at numerous meetings of farmers' associations recently, and it is to be hoped that the outcome will be a vigorous and co-ordinated campaign to combat the evil, which is a serious menace to the stock-raising industry. We have repeatedly referred to restrictive measures in this *Journal*, and in this issue we publish further material on the subject. We consider the lines along which the Matobo and the Figtree Farmers' Associations are working will form a suitable basis for similar schemes elsewhere. Veld fires were exceptionally prevalent during the months of September and October, and this is attributed partly to the idea which has gained credence amongst the natives that by burning the grass influenza and quarter-evil can be averted. There is, unfortunately, no good reason for such beliefs, and the loss in condition of cattle and deaths from poverty as a consequence have been considerable.

While referring to natives and cattle we regret to record a case illustrating how natives are sometimes imposed upon by a certain class of European. In this instance a number of native-owned cattle were found trespassing on a farm, and a beast valued at £4 or £5 levied by the owner for the trespass. The law is quite sufficient to cover trespass of this nature, and it is not surprising if retaliatory measures in such cases are taken, which may consist in burning the farm out.

The experience of the past season has shewn the supreme need of providing winter feed for stock, and it is to be hoped that more will

be done in the way of making hay and ensilage to counteract disaster in the way of grass fires and to tide over bad seasons.

There are no fresh outbreaks of African coast fever in the Territory.

In consequence of an outbreak of rabies in Bechuanaland, a Government notice has been promulgated prohibiting the importation of dogs into this Territory from the Bechuanaland Protectorate. The Union Government have prohibited the removal of dogs from Rhodesia to the Union, although we have had no case of rabies for several years.

Quarter-evil has appeared in the Mrewa district, and one case is reported from the Melsetter district. Elsewhere the position is no worse. Large supplies of vaccine are now held by the Veterinary Department, and a considerable number of doses has been distributed.

The exportation of slaughter cattle to the Rand is proceeeding apace, and good prices have been obtained, although the market is somewhat easier on account of local supplies being augmented.

The canning factory at Odzi has started operations, and Rhodesian canned meats are now on the market. Pending the arrival of the weighing machine ordered from England, cattle are being purchased by dead weight, and prices ranging from 45/- per 100 lbs. for best quality are being paid.

The season so far, from an agricultural point of view, has been very favourable, and considerable planting has been done. Reports indicate that the acreage under maize will be increased this season, enquiries from the Union for next year's crop stimulating activities. Most of the maize for export has been railed, and it is pleasing to note that little damage was done by the wet. Farmers are realising the evils of continuous cropping, and more leguminous crops are being grown.

The manurial experiments with maize which are being conducted by the Department of Agriculture this season on the magnesia soil at Makwiro will be followed with great interest by farmers in that district, as well as by others similarly situated.

Given suitable weather conditions, there will be a considerably increased acreage under tobacco this season, and the production is expected to beat all records. It is probable that the warehouse at Salisbury will not be able to grade all the crop, and this work to an extent will have to be done on the farm.

It is estimated that about 1,000 acres will be devoted to cottton this season, the bulk being grown in the Mazoe and Lomagundi districts. Plantings on an experimental scale will be made in the Salisbury, Darwin, Umtali, Mtoko and other districts, and it is to be hoped that valuable information regarding this crop will be thus made available.

One result of the excellence of last season's harvest has been the large number of beer drinks amongst the natives. The native is notoriously an improvident individual, and has little or no idea of putting by for a lean year. There is no doubt that the provision of legislative measures to prohibit the brewing of beer in extremely large quantities would be of great benefit to the native population in general.

Veterinary Report.

September, 1919.

AFRICAN COAST FEVER.

Gwelo District.—One case occurred at the infected centre, Clearwater and Northfield.

Mazoe District.—Fifty-nine cases occurred on Leopards' Vlei and 5 on Avonduur.

QUARTER-EVIL.

From various districts in Matabeleland 101 deaths were reported. In Mashonaland the disease was much less prevalent than during the previous month.

ANTHRAX.

An outbreak of anthrax occurred in Hartley district. One cow died. All in-contact cattle were inoculated.

MANGE.

An outbreak of equine scabies occurred in Bulawayo.

VELD FIRES.

Extensive veld fires occurred throughout the Territory during the month, and in many cases stockowners had considerable difficulty in obtaining grazing for their flocks and herds. In consequence of these fires dipping has been suspended in some cases, and in others the interval extended to 14 days.

IMPORTATIONS.

From the United Kingdom:—Heifers, 30; bulls, 10. From Union of South Africa:—Horses, 69; mules, 13; donkeys, 77; sheep and goats, 1,734; bulls, 70.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle by rail, 2,680; by road *via* Liebig's Drift, 1,338; horses, 8; pigs, 3. To Northern Rhodesia:—Horse, 1; donkeys, 12; sheep and goats, 195. To Portuguese East Africa:—Bull, 1; cows, 14; calves, 12; slaughter cattle, 40; goat ram, 1; horses, 2.

October, 1919.

AFRICAN COAST FEVER.

Mazoe District.—During the month 5 cases occurred at Avonduur and 24 at Leopards' Vlei.

Gwelo District.—At the infected centre, Clearwater and Northfield, there were 3 cases.

ANTHRAX.

A serious outbreak of anthrax occurred amongst cattle in the Shamva section of the Mazoe district. The disease appeared on eight farms, and to end of month over 60 deaths had occurred. All animals involved have been vaccinated with Pasteur vaccine.

QUARTER-EVIL.

From various districts in Matabeleland 254 deaths were reported. In Mashonaland there was a marked decrease in the number of outbreaks and in the mortality. In Melsetter district one case occurred on the farm Fairfield, and from the information available it would appear that this was not the first manifestation of infection. During a recent visit to this district the Chief Veterinary Surgeon was informed by an old-established farmer that he knew the disease well and had had an odd case on his own farm; apart from these and a solitary case at Umtali in 1913, there is no record of the existence of this disease in the districts east of Salisbury and those adjoining Portuguese territory.

TUBERCULOSIS.

An ox slaughtered at the Johannesburg abattoirs shewed lesions of tuberculosis. This animal was forwarded from Gwanda district.

IMPORTATIONS.

From United Kingdom:—Bulls, 2. From Union of South Africa:—Bulls, 54; heifers, 23; horses, 44; mules, 63; donkeys, 30; sheep and goats, 2,270.

EXPORTATIONS.

To Union of South Africa:—Slaughter cattle by rail, 1,653; by road *via* Liebig's Drift, 1,081; horses, 7; pigs, 27. To Northern Rhodesia:—Horse, 1; pigs, 43; sheep and goats, 130. To Belgian Congo:—Mules, 2; sheep and goats, 65. To Portuguese East Africa:—Bulls, 3; oxen, 16.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

Farming Calendar.

December.

BEE-KEEPING.

Honey in good quantities will still be coming in, as the welcome rains will be beneficial to veld blooms. Continue to give room by extracting honey from shallow frames, then return these to be refilled. Extracted honey should be drawn from the machine into the honey ripener, into which it should be strained through several thicknesses of butter muslin, remaining there, to allow surplus water to evaporate, for five days, then draw off from the tap into clear white glass bottles. All bottles must be cleansed thoroughly. See that ventilation is ample on hot days.

CITRUS FRUITS.

Citrus trees can be planted out at any time between October and the end of January. The best time is the end of October or early November, when the ground is warm and trees have hardened up their first growth of season, *i.e.*, spring growth, and are in fit condition to commence second growth, which they will do if transplanted properly at that time—end of October. Citrus trees should not be planted later than the end of January. as the growth they put on after planting later than this is very liable to be still sappy at the approach of winter, and consequently more sensible to the effect of cold. The young trees require to be well watered after planting. The soil around them should never be allowed to be really dry, but, on the other hand, it must not be kept in a state of sogginess. Immediately after planting protect the stems of the young trees from the sun by whitewashing or covering up with grass. Cut the tree down so as to leave a stem of about 2 ft. 6 ins. or 3 ft. long, and form the head of the future tree in the top 8 ins. or 1 ft., according to the best position of the shoots, not more than three or four in number. All other growths to be suppressed whenever they appear. Keep the soil nice and loose by digging, forking or hoeing round the young trees. It will then not be necessary to water them so frequently. The orchard should by this time have been thoroughly ploughed, and any cover crop sown already be up and growing. Don't forget, before the wet season, the first ploughing should be up and down the steepest gradient of the orchard, and be followed immediately after harrowing by cross-ploughing across the hill. This is to obviate as much as possible erosion of the soil during the coming heavy rains. Remember that, if a long spell of dry weather occurs during the so-called wet season, your bearing orange trees will probably require an application of water, otherwise the crop of fruit may receive a check from which it will never properly recover.

CROPS.

This is the busiest planting month of the farm year, during which most crops should be sown. Maize planting is usually commenced in November and continued through December, but should be finished if possible at latest by Christmas. Light harrowing with the Hallick weeder or light tooth harrow immediately after germination and until the plants are 6 to 10 inches high is beneficial in keeping down weeds and maintaining a soil mulch. This harrowing is better done during the heat of the day, when the plants are less liable to break off.

Sunflower, ground nuts, pumpkins, sweet potatoes, cattle melons, mangels and velvet beans for seed should all be in by the latter part of the month at latest, and earlier if possible.

Linseed, teff grass, Boer manna, buckwheat, bean crops for green manure, summer wheat and oats and main crop potatoes should be seeded between Christmas and the end of the first week in January.

DAIRYING.

The hot weather having now begun, farmers will find it very difficult to keep their dairy produce in good condition. Especially does this apply to cream producers, who have in many cases long distances to send their cream before it reaches a factory. Cream must be cooled down immediately it comes from the separator; this is of the utmost importance. Allow the fresh cream to remain by itself until the next separation takes place before mixing it with an older cream. The longer you can keep apart any two creams of different ages, the better and the longer will the cream remain sweet. Keep cream cans cool by the application of wet sacks, etc.

ENTOMOLOGICAL.

Maize.—Plant during first half of this month to avoid stalk borers. See "Maize Stalk Borer," *Agricultural Journal*, December, 1917. Distribute poisoned bait shortly before or immediately after planting on red soils to destroy various pests, including surface beetles, snout beetles, etc., which may affect the stand. See "Maize on Red Soils," *Agricultural Journal*, April, 1919. Cutworms and Maize Beetle (*Heteronychus*) may be in evidence. See "Cutworms," *Agricultural Journal*, August, 1918, and the "Maize Beetle," *Agricultural Journal*, February, 1918.

Tobacco.—The newly planted crop is subject to the attack of cutworms, surface beetles, stem borers, leaf miners, "wireworms," grasshoppers, large crickets, etc. A good deal of protection may be obtained by dipping the tops of the transplants as far as the roots in arsenate of lead 1 lb. to 15 gallons of water. See *Agricultural Journal*, December, 1919, and February, 1920.

Potato.—Ladybirds may be injurious to the foliage. See "Two Ladybirds injurious to Potato Plants," *Agricultural Journal*, October, 1913. On sandy soils blue blister beetles may be troublesome. An immediate spraying with arsenate of lead 1 lb. to 12 gallons water should give relief.

Cabbage, Turnip, etc.—Webworm and diamond back moths are still the main pests. See "Cabbage Webworm," *Agricultural Journal*, February, 1914. Dusting with Paris green and lime should give protection against both pests.

Bean.—Stem maggot may be serious in December, especially if previous crops have been grown for French beans in gardens. See "Bean Stem Maggot," *Agricultural Journal*, April, 1913.

Melon, Marrow, etc.—Leaf-eating beetles frequently destroy the very small plants entirely. Spray with an arsenical and sugar wash or dust with Paris green 1 lb., lime 20 lbs.

Deciduous Trees.—Chafer beetles, fruit beetles are commonly very troublesome. See "Chafer Beetles," *Agricultural Journal*, December, 1914.

Fig.—Collect and destroy all fruit infested with fig weevil, and any wild figs near to the orchard.

Mosquitoes, House Flies, Stable Flies.—Destroy all breeding places round homestead. Poison or trap adults. See *Agricultural Journal*, June, 1915, and December, 1916.

FLOWER GARDEN.

This month is generally showery, and constant stirring of the soil is, therefore, necessary to keep it loose. Seeds of perennials and annuals for

February blooms may be sown. Transplanting should be done in the evening or on a cloudy day. Carnations should be kept free from dead wood, and climbers attended to.

FORESTRY.

Give the ground the final harrowing, and if the season is a normal one, planting out should commence. This is the ideal month for planting out in a normal season, as the young trees have the benefit of all the summer rains, and become well established before the dry winter months arrive. Plant on dull, rainy days, or failing such days, late in the afternoons.

POULTRY.

During this month some of the birds will be commencing to moult, during which process a bird is inclined to put on fat; in such a condition the period of moulting is drawn out, and she is less likely to lay. It is possible to induce laying during the moult by keeping the birds in good hard lean condition, and giving them foods suitable for the growth of feathers, such as sunflower seed, linseed, additional meat, insects, thick separated milk, or as an alternative fish meal, a little flowers of sulphur in the dry mash, and such green foods as cabbage and cauliflower leaves, which contain sulphur. The moult will, however, be treated fully in a future article.

The birds should if possible be kept confined during wet weather, scratching for their grain in deep litter on the floor of their houses or under cover of some sort; this means a far greater number of eggs and healthier birds.

Keep the nests clean and dry—nothing is worse than a dirty egg—and do not let broody hens stay on the nests. They should be taken away as soon as they shew signs of broodiness, and placed in a wire netting coop, with wooden slats on the floor, and fed sparingly. Broody hens at this time of the year are unprofitable, and eggs are wanted from them; they occupy the nests to no purpose, and damage the eggs, which should be collected twice a day in hot weather to ensure their keeping fresh and good.

Those poultry keepers who have birds in runs should take the advantage during the wet weather of growing a crop in them; nothing sweetens the ground better and removes the taint than a quick-growing crop. Dig the runs over and sow barley, oats, wheat, etc.; when 2 to 4 inches high these crops can be fed off and the ground is again quite sweet and free from taint.

Keep the young stock growing and do not let them get wet. It is important that they go to roost dry and sleep comfortably, otherwise it results in colds, bronchitis, etc.

Do not hatch any more turkeys; the chicks of these to do well *must* be kept dry, and in their young stages even damp air is detrimental to them. A little wet weather will not hurt young ducklings, but they too must sleep dry. Do not forget that hard sharp grit and charcoal should be *always* within reach of the birds, and if possible thick separated milk—three of the chief essentials for health and production.

STOCK.

Cattle.—The veld in most districts is now good, and little trouble in respect of grazing is likely to be experienced. Ranching cattle should not require any attention beyond dipping, but any stock that are in weak condition will be the better for a little hay or a pound or two of maize at night until they have regained strength. The bulls should be returned to the herd either at the end of the month or in January, and it should be remembered that the better they are conditioned and fitted for their work the more hope there is of a good crop of calves. For this reason also every effort should be made to have all the female stock in strong condition. Dairymen will find that as the grass becomes lush and rank a supply of sweet veld hay, teff hay or, say, three pounds of crushed maize given in the sheds at night will enhance both the quality and quantity of the milk. This will be found

to be the case more particularly in districts of heavy rainfall. Milch cows should be protected as much as possible from cold rains and hot sun. Yarding all night in a clean kraal provided with a simple lean-to shed well bedded up will be found to be very beneficial in seasons of protracted rainfall. The calf pen should be kept clean, dry and sweet, and young calves will be better kept in during very hot or very wet weather. Dipping should be regularly attended to.

Sheep.—Graze on the higher lands, keeping the kraals clean, dry and airy, and watch for ticks.

TOBACCO.

Continue preparation of land. The best results are obtained by transplanting on freshly prepared soil. Transplanting should be pushed as fast as transplants and climatic conditions will allow. As soon as plants begin to grow, go over the field and fill in all missing hills with strong selected plants. Cultivation should be commenced as soon as the plants start growing, especially on sandy soils. The crust caused by heavy rains should be pulverised through cultivation as soon as the surface soil is dry enough for tillage; this gives the young plants the benefit of the moisture stored in the soil. Do not neglect the late sown seed beds. Make every effort to finish transplanting before the end of the month, so that the crop will be harvested before dry, cool weather begins.

VEGETABLE GARDEN.

All vegetable seeds may be planted. All advanced plants should be constantly cultivated. Potatoes should be ridged, and peas, beans and tomatoes staked. This is a good month for planting the main crop of potatoes.

VETERINARY.

Occasional cases of horsesickness may occur during this month. With the great increase in ticks, due to the heat and moisture, cases of redwater and gallsickness may be expected, more especially amongst Colonial stock imported since the last rainy season. The cool weather which frequently follows the early rains is an excellent time for castrating calves and other animals.

WEATHER.

In Mashonaland usually six inches of rain fall this month, and in Matabeleland five inches, but considerable variations occur. Less rain usually falls at this time in extreme southern parts of the country. Very heavy downpours may be looked for, and it is well to be provided by drains and ditches against the effects of heavy rain storms. A dry spell about Christmas time is a very frequent, though not invariable, event in Rhodesia. This partial drought may last only a fortnight or may extend to six weeks; in the latter event often causing some anxiety regarding young crops, especially those not yet through the ground. The best means of meeting this condition of the weather is by frequent surface cultivation by harrow or horse hoe, to preserve a loose soil mulch on the surface and prevent losses of soil moisture by evaporation.

January.

BEE-KEEPING.

Where it is desirous, artificial swarms can now be made, so also can nuclei be formed from proved best working strains. All the above must be stimulated with food. In the cooler districts it will be necessary to contract the entrances and close down for winter.

CITRUS FRUITS.

(See under December notes.)

CROPS.

Sowings of beans, wheat, oats, field radish and maize for silage may be continued up to the middle of the month in normal seasons. Catch crops of teff and buckwheat can also generally be put in with good prospect of success. Planting out Napier fodder and Kikuyu grass may be continued.

DAIRYING.

Being now well into the summer months, attention should be given to the percentage of fat in the cream. The cream should contain a higher per cent. of fat in the summer than in the winter. Adjust the cream screw of the separator so as to give you cream testing from 38 to 44 per cent. of fat. This is a higher percentage than is required in the winter months, the reason being that the richer the cream is the better it carries, and the sweeter it keeps. Cream testing over 44 per cent. is more difficult to test than a thinner cream, and mistakes in testing are more liable to occur. Cheese making will now be in full swing, and the requirements for the production of good milk of sound quality depend on the proper treatment of the milk when obtained from the cow, and subsequent to its manufacture. All the means by which milk may possibly become contaminated must be carefully avoided. The slightest possible taint in milk, through the food given, dirty milking sheds, dirty milkers and utensils, etc., etc., will always be strongly in evidence in the cheese produced from it or in butter.

ENTOMOLOGICAL.

Maize.—This crop is subject to the attack of stalk borer, maize beetle (*Heteronychus*), snout beetles, grasshoppers, crickets, etc. See *Agricultural Journal*, April, 1919. Maize planted after the first of the year is extremely liable to almost complete failure as a crop from the second brood of the stalk borer. See *Agricultural Journal*, December, 1917. This is of less importance in regard to ensilage.

Tobacco.—Most of the pests of this crop are active during January, *e.g.*, stem borer, leaf miner, "wireworms," surface beetles, large crickets, grasshoppers, etc. See *Agricultural Journal*, December, 1919, February, 1920.

Potato.—Certain ladybirds are apt to defoliate the young potato plants of the main crop, especially on farms where early potatoes are also grown. See *Agricultural Journal*, October, 1913. Blue blister beetles are apt to be injurious on sandy soils, and may be checked by spraying with arsenate of lead 1 lb. to 12 gallons of water. Spraying should be commenced for early blight. See *Agricultural Journal*, August, 1913.

Cabbage Family.—Plants of this family are subject to the attacks of webworm and sawfly in January. See *Agricultural Journal*, February, 1914, April, 1910, April, 1917, June, 1918.

Beans and Cowpeas.—These suffer chiefly from stem maggot. See *Agricultural Journal*, April, 1913. On small plots aphis may be checked by spraying with tobacco wash or paraffin emulsion.

Melon Family.—The chief pests in January are leaf-eating beetles. Spray with an arsenical wash or cover young plants.

Citrus Trees.—The fruit is subject to the attack of citrus codling. Collect and destroy the infested fruits. For this and other citrus pests see *Agricultural Journal*, February, 1916.

Deciduous Fruits.—These are all subject to the attack of fruit-eating beetles. See "Chafer Beetles," *Agricultural Journal*, December, 1914. Fruit

moths are injurious during this month, the only preventive measure being to net the trees. For fruit fly remedies, see *Agricultural Journal*, August, 1911.

Fig.—The adult beetles of the fig borer are to be found on the young shoots. They should be destroyed. The grubs in the stems may be killed with a little carbon di-sulphide.

Mosquitoes, House Flies, Stable Flies.—See under previous month.

FLOWER GARDEN.

This month requires all one's energy in the flower garden. Annuals may still be sown for late flowering before the season is over. Planting out should be done as early as the weather permits, and advantage taken of a dull day after a shower for this work. If care be exercised much smaller plants may be put out than would at first be thought advisable, as with attention these will make stronger plants than larger ones, which are more likely to receive a check. The soil requires constant stirring, owing to the packing caused by the rains and for the eradication of weeds, which are now very troublesome. All plants should be kept free of dead and decaying matter.

FORESTRY.

If the rains are seasonable, plant out evergreen trees, such as gums, cypress, pines, etc. Fill in all blanks as soon as they are noticed, and do not leave them until the following season. Planting should be done on a wet day, or failing that, on a dull day, or late in the afternoons.

POULTRY.

The young stock should be well advanced and many of the early hatched pullets laying. Be careful they do not steal their nests, as this is the period at which a bird is most likely to do so; therefore, as the pullets begin to shew signs of laying, *i.e.*, filling out in body, reddening up in face, comb and wattles, and cackling, put a few nests in and near the house in quiet fairly dark places to encourage them to take to these. Some people adopt an excellent plan (it means the expenditure of a little more time and trouble, but it is worth it), as follows :—As the birds shew signs of commencing to lay, they are put in to a house and run, and fed practically the same food as they were having on free range, with comfortable clean nests in it. They soon take to these, and are then let out, and will return to them in the future to lay.

Most of the young cocks should now have been disposed of for eating; to keep them much longer means a loss. Look well after the hens that are moulting, for the more comfortable and contented they are the sooner will they get through the moult and begin laying again.

STOCK.

Cattle.—The recommendations for December apply equally to this month. Bulls should be returned to the herd during the month if a September or October calving season is desired.

Sheep.—Continue as recommended for December. If heavy rains are experienced a daily ration of half a pound of maize per ewe will keep them in condition and will often prevent much trouble arising from poverty and anæmia. Those who favour autumn lambs must put the ram again with the flock in February, and should therefore now take steps (if necessary) by supplying a little extra feed as above recommended to fit the ewes for mating. A little forethought of this kind will tend to increase the stamina of the lambs and to bring the ewes in season more or less together, so that a protracted lambing season is avoided.

TOBACCO.

Cultivation should be systematically continued, and no foreign vegetation allowed in the tobacco field, as weeds and grass induce insect attacks. All backward plants should be given special attention, and an additional application of fertiliser to hasten growth, so that the plants ripen as uniformly as possible. Curing barns should be placed in proper condition on rainy days, and all tobacco appliances should be placed in proper order for the rush of work during curing season. Early planted tobacco may be ready for topping during the latter part of the month, and the common mistake of topping too high should be avoided. Go over the field carefully, and select typical, uniform plants for producing seed for next season's crop.

VEGETABLE GARDEN.

Turnips, carrots, cabbage, lettuce, etc., may be sown for carrying on during the winter months. Potatoes may be planted this month for keeping through the winter. Weeding and cultivating between the rows should be continually carried on.

VETERINARY.

Horsesickness may now be expected, especially in districts where early heavy rains have occurred. Blue tongue in sheep will also be prevalent.

WEATHER.

Heavy rain is to be looked for, and during this month we may normally expect nine to twelve inches on the eastern border, seven-and-a-half in the north, and less as one travels westwards or southwards. At this time of year the rainfall tends to be heavier in the eastern than in the western portions of the Territory, whilst prolonged steady rains take the place of the thunder showers which marked the earlier part of the wet season. The growing period is at its height, and high temperatures are registered.

Weather Bureau.

EVAPORATION, CLEVELAND RESERVOIR, SALISBURY

Year.	Month.	Monthly Evaporation. Inches.	Daily Maximum. Inches.	Daily Minimum. Inches.	Daily Mean. Inches.
1919	September	9·29	0·40	0·21	0·31
1919	October	9·78	0·49	0·11	0·31

TEMPERATURES.

Station	September		October	
	Mean Max.	Mean Min.	Mean Max.	Mean Min.
MASHONALAND—				
Charter—				
Enkeldoorn	82·6	41·8	85·7	45·1
Hartley—				
Franceys Farm	87·3	51·4	92·7	55·7
Gatooma	89·4	54·5	92·1	60·7
Hartley Gaol	—	—	—	—
Lomagundi—				
Sinoia	87·6	70·6	88·4	65·5
Sipolilo	86·2	57·3	88·1	60·4
Mazoe—				
Mazoe Dam	79·7	46·8	82·8	53·1
Shamva Mine	86·2	54·5	—	—
Citrus Estate	81·7	53·2	83·2	58·5
Melsetter—				
Melsetter	75·4	50·5	77·9	53·2
Mount Selinda	76·5	51·9	83·2	53·8
Vermont	78·3	52·9	80·9	56·9
Salisbury—				
Botanical Experiment Station...	81·0	51·8	81·2	54·9
Chishawasha	83·2	48·6	83·6	54·2
Salisbury Gaol	82·3	48·5	83·3	51·4
Umtali—				
Umtali Gaol	—	—	—	—
Victoria—				
Eythorne	79·5	49·7	86·8	55·0
Victoria	78·4	52·6	—	—

TEMPERATURES—(*Continued*).

Station	September Mean Max.	September Mean Min.	October Mean Max.	October Mean Min.
MATABELELAND—				
Bulalima-Mangwe—				
Empandeni	83·2	52·8	87·0	59·0
Garth	83·0	56·0	89·4	59·3
Plumtree School	83·8	64·8	—	—
Retreat	92·8	53·0	99·2	62·6
Riverbank	88·5	54·2	91·8	58·9
Bulawayo—				
Observatory	81·0	53·7	85·3	57·7
Gwanda—				
Antelope Mine	84·3	61·9	91·6	69·6
Mazunga	88·7	54·5	—	—
Tuli	88·2	73·4	99·4	85·1
Gwelo—				
Gwelo Gaol	80·7	45·6	85·9	49·7
Matobo—				
Holly's Hope	86·6	52·6	90·7	59·1
Rhodes Matopo Park ...	86·6	52·3	93·6	57·1
Umzingwane—				
Essexvale	85·2	51·9	88·7	58·9
Hope Fountain	—	—	—	—
Wankie—				
Guyo	91·4	52·3	95·5	56·0
Victoria Falls	89·3	66·2	—	—
Wankie Hospital	93·6	63·5	98·4	68·0

RAINFALL.

Station	September	October	Seasonal to date.
MASHONALAND—			
Charter—			
Buhera	0·22	1·48	1·70
Bushy Park	0·67	0·91	1·58
Enkeldoorn Gaol	0·55	1·99	2·54
Marshbrook	0·85	1·12	1·97
Range	1·10	1·86	2·96
Riversdale	...	1·20	1·20
Umniati	0·70	2·70	3·40
Vrede	0·18	1·57	1·75
Wylde Grove	0·75	1·34	2·09
Chibi—			
Chibi	0·22	...	0·22
Lundy River	0·51	0·11	0·62
M'Rumi	—	—	—
Nuanetsi Ranche	...	—	—

RAINFALL—(*Continued*).

Station	September	October	Seasonal to date.
MASHONALAND—(Continued)			
Chilimanzi—			
Central Estates	1·12	1·38	2·50
Chilimanzi	1·49	0·92	2·41
Driefontein	0·70	1·52	2·22
Felixburg	1·17	0·74	1·91
Induna Farm	0·60	2·30	2·90
Orton's Drift	—	—	—
Umvuma (Railway)	0·59	2·29	2·88
Darwin—			
Mount Darwin	—	—	—
Gutu—			
Chingombe	0·30	0·27	0·57
Eagle's Nest Ranche	1·20	1·13	2·33
Gokomere	0·98	0·20	1·18
Gutu	1·03	0·51	1·54
M'vimvi Ranche ...	0·88	0·67	1·55
Noeldale	0·73	0·73	1·46
Hartley—			
Ardgowan	0·39	1·00	1·39
Battlefields (Railway) ...	0·76	0·90	1·66
Beatrice (B.S.A.P.) ...	0·78	1·51	2·29
Cringleford	0·22	1·58	1·80
Elvington	0·56	2·48	3·04
Franceys Farm	0·48	0·88	1·36
Gadzema (Railway)	0·44	1·51	1·95
Gatooma	...	1·26	1·26
Gatooma (Railway)	...	1·27	1·27
Gowerlands	0·51	2·02	2·53
Hallingbury	...	1·00	1·00
Hartley Gaol	—	—	—
Hartley (Railway)	0·10	0·92	1·02
Hopewell	0·24	0·94	1·18
Makwiro (Railway)	0·42	3·15	3·57
Ranwick	0·38	0·65	1·03
Shagari (Chevy Chase) ...	0·02	1·03	1·05
Spitzkop	...	0·63	0·63
Inyanga—			
Inyanga	...	1·02	1·02
Inyanga Settlement	1·10	1·51	2·62
Rhodes Estate	...	2·77	3·11
St. Trias' Hill	0·43	3·70	4·13
York Farm	0·05	1·46	1·51
Lomagundi—			
Argyle	0 60	0·65	1·25
Banket Junction (Railway) ...	...	1·00	1·00
Darwendale	...	0·51	0·51
Duxbury Farm	0·01	1·14	1·15
Eldorado Mine	—	—	—
Eldorado (Railway)	...	1·38	1·38
Gambuli (Mukore)	1·0	0·38	1·38
Lone Cow Estate	...	1·45	1·45
Longmead	...	1·08	1·08
Maningwa	—	—	—
Mukwe River Ranche... ...	0·04	—	—

RAINFALL—(*Continued*).

Station	September	October	Seasonal to date.
MASHONALAND—(Continued)			
Lomagundi—continued			
Palm Tree Farm	0·12	2·12	2·24
Sinoia	...	1·14	1·14
Sinoia (Railway)	1·02	0·82	1·84
Sipolilo	...	0·13	0·13
Umvukwe Ranche	...	1·46	1·46
Makoni—			
Carlow Farm	0·40	—	—
Chimbi Source	—	3·59	3·59
Craigendoran	0·23	1·54	2·02
Delta	0·53	1·99	2·52
Eagle's Nest Ranche	0·80	1·01	1·81
Forest Hill	0·77	4·67	5·54
Gorubi Springs	...	1·37	1·37
Headlands (Railway)	0·50	0·75	1·25
Mona	0·91	1·93	2·84
Monte Cassino Mission ...	...	1·31	1·31
Odzi (Railway)	...	1·95	1·95
Rusape	0·34	1·30	1·64
Rusape (Railway)	0·28	1·26	1·54
Springs	0·94	—	—
Marandellas—			
Bonongwe...	0·98	1 79	2·77
Huish Estate	0·60	1·61	2·21
Land Settlement Farm ...	0·03	1·01	1·04
Macheke (Railway)	1·30	2·48	3·78
Marandellas	1·30	1·45	2·75
Marandellas (Railway) ...	1·47	2·14	3·61
Nelson	0·35	1·76	2·11
Selous Nek	...	1·33	1·33
Theydon Farm	—	—	—
Tweedjan	...	2·60	2·60
Verdoy	—	—	—
Mazoe—			
Avonduur	—	—	—
Bindura	...	1·19	1·19
Bindura (Railway)	...	1·48	1·48
Ceres	...	0·79	0·79
Chipoli	...	1·97	1·97
Citrus Estate	...	0·90	0·90
Concession (Railway)	...	1·32	1·32
Craigengower	...	—	—
Dunmaglas	...	—	—
Glendale (Railway)	...	1·35	1·35
Kilmer	...	—	—
Kingston	...	0·90	0·90
Laguaha	...	—	—
Lowdale	—	1·51	1·51
Mazoe	...	—	—
Mazoe Dam	...	0·85	0·85
Mguta Valley	...	0·69	0·69
Omeath	...	2·00	2·00
Ruia	...	1·43	1·43
Ruoko Ranche	...	2·01	2·01

RAINFALL (*Continued*).

Station	September	October	Seasonal to date.
Mashonaland—(Continued)			
Mazoe—continued			
Shamva	...	0·85	0·85
,, Mine	...	—	—
Stanley Kop	...	1·12	1·12
Sunnyside	...	1·09	1·09
Teign	...	1·57	1·57
Virginia	...	1·36	1·36
Volynia Ranche	...	0·54	0·54
Melsetter—			
Brackenburg	1·29	1·28	3·43
Chikore	—	—	—
Chipinga	0·28	2·38	3·17
Helvetia	0·21	1·82	2·03
Melsetter	0·15	1·15	1·30
Mount Selinda	0·69	1·23	1·92
Mutambara Mission	...	0·48	0·48
Pasture	—	—	—
Tom's Hope	0·24	2·49	2·89
Vermont	0·80	2·16	2·96
Mrewa—			
Glen Somerset	0·12	—	—
Mrewa	...	—	—
Mtoko—			
Makaha	...	0·30	0·30
Mtoko	...	—	—
Ndanga—			
Bikita	0·90	0·38	1·81
Chiredzi Ranche	1·00	—	—
Marah Ranche	0 36	...	0·36
Ndanga	0·91	0·45	1·77
Salisbury—			
Ardbennie	...	1·82	1·82
Avondale	0·02	—	—
Borrowdale (Hatcliffe) ...	—	—	—
Botanical Experiment Station ...	...	2·01	2·01
Bromley	...	0·55	0·55
Brookmead	—	—	—
Chishawasha	...	1·78	1·78
Cleveland Reservoir ...	...	2·78	2·78
Ewanrigg	—	—	—
Forest Nursery	—	—	—
Glenara	...	2·65	2·65
Goromonzi	...	1·23	1·23
Gwebi	...	1·32	1·32
Hillside	...	3·78	3·78
Lilfordia	0·44	—	—
Meadows (The)	...	2·74	2·74
Salisbury (Gaol)	...	2·44	2·44
,, (Railway)	—	2·30	—
Sebastopol	...	2·00	2·03
Selby	...	0·38	0·38
Stapleford	...	2·56	2·56
Sunnyside	—	—	—
Vainona	...	2·60	2·60
Westridge	—	—	—

RAINFALL *(Continued).*

Station	September	October	Seasonal to date.
MASHONALAND—(Continued)			
Umtali—			
Hoboken	—	—	—
Muromo Ranche	0·08	0·66	0·74
Odzani	0·05	1·15	1·51
Odzi Drift...	...	2·66	2·67
Penhalonga	0·13	2·35	2·91
Premier Estate	...	0·68	0·69
Public School	—	—	—
Reservoir	0·14	1·56	1·94
Sarum	0·18	1·85	2·03
Stapleford	0·46	3·35	4·13
St. Augustine's Mission ...	0·03	2·13	2·56
Stralsrund	...	1·26	1·26
Umtali (Railway)	...	1·21	1·27
Utopia	0·10	—	—
Victoria—			
Bruceham	0·44	—	—
Clipsham	0·50	0·15	0·65
Empress Mine	—	0·69	—
Eythorne	0·45	0·21	0·66
Fort Victoria (Railway) ...	0·46	0·15	0·61
Jichidza Mission ...	2·07	0·44	2·51
Makorsi River Ranche ...	0·35	0·44	0·84
Morgenster Mission	0·75	0·36	1·11
Silver Oaks	1·22	0·78	2·00
Summerton	0·52	0 21	0·73
Victoria	0·43	—	—
MATABELELAND:			
Belingwe—			
Bickwell	...	2·36	2·36
Tamba	0·13	0·04	0·17
Wedza	1·05	0·34	1·39
Bubi—			
Bembesi (Railway)	0·40	0·10	0·50
Imbesu Kraal	0·30	0·33	0·63
Inyati	0·65	0·44	1·09
Maxim Hill	0·53	...	0·53
Shangani Estates	0·45	—	—
Bulalima-Mangwe—			
Empandeni	0·03	0·03	0·06
Figtree	0·12	0·29	0·41
Garth	0·06	0·15	0·21
Holdstock	...	—	—
Maholi	—	—	—
Plumtree Public School ...	0·17	—	—
Retreat	0·60	0·36	0·96
Riverbank Farm	0·14	0·41	0·55
Solusi Mission	0·05	0·25	0·30
Tjankwa	—	—	—
Tjompanie	0·14	1·69	1·83
Bulawayo—			
Keendale	0·16	0·27	0·43
Khami, Fairview Farm ...	0·27	—	—

RAINFALL *(Continued)*.

STATION	September	October	Seasonal to date.
MATABELELAND—(Continued)			
Bulawayo—continued			
Lower Rangemore	0·39	0·30	0·69
Observatory	0·14	0·37	0·51
Raylton (Railway)	0·32	0·41	0·73
Saw Mills (Railway)	0·65	0·15	0·80
Umgusa	0·29	—	—
Gwanda—			
Antelope Mine	0·05	0·03	0·08
Gwanda (Gaol)	0·40	0·77	1·17
Gwanda (Railway)	0·11	0·96	1·07
Lamulas	...	0·40	0·40
Langalanga	...	0·17	0·17
Mahalali	...	...	...
Manantji	0·03	0·07	0·10
Mazunga	0·05	—	—
Mapande	...	0·37	0·37
Mrandas	0·11	...	0·11
Mtshabezi Mission	0·18	0·54	0·72
Mwanezi	0 28	0·15	0·43
Sovelele	0·25	0·14	0·39
Tuli	...	0·14	0·14
West Nicholson (Railway) ...	...	...	...
Gwelo—			
Daisyfield	1·13	...	1·13
Dawn	0·45	0·56	1·03
Globe and Phœnix Mine ...	0·29	3·34	3·63
Globe and Phœnix (Railway) ...	0 24	3·57	3·81
Gwelo (Gaol)	0·83	1·37	2·20
Gwelo (Railway)	0·86	1·05	1·91
Hunter's Road	0·70	0·82	1·52
Lalapanzi (Railway)	0·65	2·36	3·01
Lovers' Walk	0·78	0·57	1·35
Lower Gwelo	1·00	1·53	2·53
Oaklands	0·58	0·45	1·03
Rhodesdale Ranche	...	1·21	1 21
Rio	0·79	0·76	1·55
Riverdale	0·34	1·14	1·48
Sikombela Farm	...	—	—
Woodendhove	...	1·14	1·14
Insiza—			
Albany	1·05	...	1·05
Filabusi	0·10	...	0·10
Fort Rixon	0·76	—	—
Infiningwe	0·34	...	0·34
Insiza (Railway)	—	—	—
Inyezi Farm	...	0·43	0·43
Orangedale	0·93	—	—
Roodeheuvel	0·82	0·24	1·07
Shangani (Railway)	0·88	0·22	1·10
Thornville	1·10	—	—
Matobo—			
Holly's Hope	0·05	0·05	0·10
Matopo Mission	1·58	—	—
Rhodes Matopo Park ...	0·16	0·17	0·33

RAINFALL (*Continued*).

Station	September	October	Seasonal to date.
MATABELELAND—(Continued)			
Nyamandhlovu—			
Edwaleni	—	—	—
Impondemi	0·45	—	—
Kalaka	0·04	0·37	0·81
Melinakanda Junction ...	—	—	—
Naseby Farm	...	0·50	0·50
Nyamandhlovu (Railway) ...	0·40	1·82	2·22
Nyamandhlovu (N.C.) ...	—	—	—
Sebungwe—			
Gokwe	0·29	1·71	2·00
Inyoka	...	1·09	1·09
Selukwe—			
Hillingdon	0·44	0·49	0·94
Selukwe (Railway)	0·88	1·18	2·06
Aberfoyle Ranch	1·03	—	—
Umzingwane—			
Balla Balla (Railway) ...	0·42	0·18	0·60
Crombie's Hotel	—	—	—
Essexvale	1·35	0·12	1·47
Heany Junction (Railway) ...	0·40	0·68	1·08
Hope Fountain	—	—	—
Ntabenende	0·35	0·44	0·79
Springs Farm	0·28	0·46	0·74
Wankie—			
Dett (Railway)	1·80	0·87	2·67
Guyo	0·32	0·66	0·98
Lynwood Estate	0 35	0·71	1·06
Matetsi (Railway)	—	0·66	—
Ngamo (Railway)	0·35	0·30	0·65
Victoria Falls	...	—	—
Victoria Falls (Railway) .	...	0·63	0·63
Wankie Hospital	0·10	0·71	0·81
Wankie (Railway)	0·23	0·64	0·87

... means nil.
— means no return.

Dates of Meetings of Farmers' Associations, Southern Rhodesia

(SUBJECT TO ALTERATION)

Name of Association	Place of Meeting	Secretary	1919-20 December	January	February
Beatrice Road	Various farmhouses	A. V. Johnson	No	fixed	dates
Bembesi	Queen's Mine Hotel	V. C. Andrews	5	2	6
Bindura	Bindura	G. Askew	13	10	14
Bromley	Bromley	C. J. Shirley	1	1	5
Charter—Mgezi	Beatrice Mine	W. Krienke	31	..	25
Central	Umvuma	W. A. James	27	31	28
Darwin	Darwin	H. Wessels	14	11	8
Eastern Border (South Melsetter)	Helvetia	——	12	9	13
Eastern Districts	Good Hope Farm	G. F. Robertson	13	10	14
Enterprise	Arcturus Hotel	R. Philip	3	7	4
Felixburg—Gutu	Felixburg	R. H. Brown	..	..	..
Figtree Branch, R.L. and F.A.	Figtree Hotel	W. H. Robertson	6	..	7
Gatooma	Gatooma	T. J. Golding	20	17	21
Gazaland	Chipinga	J. Myers	..	..	..
Greystone	Various farm houses, Shangani	M. Kerr	13	10	14
Hartley	Hartley	J. de L. Nimmo	6	..	..
Headlands	Headlands	J. Grewar	27	..	28
Hunter's Road Farmers and Stockowners	Hunter's Road Siding	R. H. Twilley	13	10	14
Insiza—Shangani	Shangani	M. E. Weale	6	..	..
Inyanga	Rhodes Inyanga Estate	E. J. Hacking	6	10	14
Inyazura	Inyazura	H. B. Curling	17	21	18
Iron Mine Hill	Iron Mine Hill	T. Irving	13	10	14
Lalapansi	Lalapansi	B. J. Ingle	20	17	21
Lomagundi	Sinoia	A. H. Layard	6	..	..
Macheke	Macheke	——	No	fixed	dates
Makwiro	Makwiro	D. M. Syme	19	16	20
Makoni North	Makoni	J. G. Monckton	27	31	28
Makoni	Rusape	R. C. Maclagan	13	10	14
Marandellas, Northern	Marandellas Farmers' Hall	A. Nicholson	6	3	7
Marandellas, Southern	Inoro	J. Gibberd	3	7	4
Mashonaland	Commercial Hotel, Salisbury	J. Reid Rowland	3	7	4
Mashonaland, Northern Section	Various	T. H. Newmarch	No	fixed	dates
Mashonaland, Western Section	Various	J. W. Dunlop	No	fixed	dates
Matopo Branch, R.L. and F.A.	Sibali	——	..	14	..
Mazoe	Glendale Siding	R. C. Yeoman	10	14	11
Melsetter North	Various farms	N. N. Rutherfurd	6	..	..
Midlands Farmers and Stockowners	Gwelo	Cyril Allen	12	9	13
Northern Umtali	Farm Summerfield	R. O. H. Blurton	6	..	..
Norton and District	Norton Store	W. Wrench	6	3	7
Que Que	Que Que	E. J. Ross	20	17	21
Rhodesian Landowners and Farmers	Library Buildings, Bulawayo	H. S. Hopkins	19	30	27
Selous	Various farms	A. L. Douglas	20	17	21
Selukwe	Selukwe	F. S. Clark	No	fixed	dates
Shamva	Shamva	R. C. Frith	..	21	..
Somabula and Shangani Flats	Weltevrede School	G. B. Botha	..	..	14
Umvukwe	Various ranches	Capt. G. H. Gordon, Banket Junction	13	17	14
Umtali	Royal Hotel, Umtali	J. S. Holland	11	1	5
Victoria	Victoria	——	5	2	6
Vungu	Vungu	J. H. Erasmus	..	..	..
Western	Plumtree Hotel	A. Barclay	13	10	14

Departmental Notices.

The full series of notices usually published under this head no longer appears, and will be omitted in future. New notices and amendments of old ones will be published from time to time. The departmental announcements with which our readers are familiar, nevertheless, remain in force as before. The services of the officers of the Department are always available, whether it be for replying to enquiries or by personal visits to farms or by lectures to associations. Full particulars can be obtained from the Director of Agriculture, Salisbury, in reference to any of the subjects previously dealt with in these pages, such as supply of seeds and trees, co-operative seed distribution, insect pests, chemical analyses, and technical advice on veterinary matters, irrigation, citrus culture, poisonous plants and plant identification, examination of soils, dips, products, etc.; and generally on all questions relating to live stock and to tillage operations.

Services of Irrigation and Agricultural Engineer.

Farmers desiring the services of the Irrigation Engineer should make application in writing to:—The Irrigation and Agricultural Engineer, Department of Agriculture, Salisbury, at least one month before the date that the visit is required.

Forest Nursery—Sale of Trees

The undermentioned varieties of trees are now available, price, f.o.r. Salisbury, 1d. each, 8s. 4d. per 100. The following reductions are made on large orders:—£3 per 1,000, £2 10s. per 1,000 for orders of over 5,000. Average height of trees, 3 to 9 inches; average number in tin, 25; average weight of tin, 25 lbs. If tins are not returned within a month, they will be charged for at the rate of 6d. each.

Callitris calcarata—Cypress pine.
,, robusta—Murray pine.
Casuarina leptoclado—Beefwood.
Cedrela toona.
Cupressus torulosa—Himalayan cypress.
Eucalyptus botryoides.
,, calophylla—White flowering gum.
,, citriodora—Lemon-scented gum.
,, crebra—Ironbark.
,, paniculata—Ironbark.

Eucalyptus robusta—Swamp mahogany.
,, rostrata—Red gum.
,, saligna.
,, maculata—Spotted gum.
Grevillea robusta—Silky oak.
Jacaranda.
Loquat.
Thuya orientalis—Arbor vitæ.

Hedge Plants (plant 12 to 18 inches apart).

Callistemon—Bottle brush.
Dodonaea viscosa.
Tecoma Smithii.

Larger sized trees at 3d. each, 4 in tin, weighing 25 lbs. :—

Callitris calcarata—Cypress pine.
Casuarina leptoclado—Beefwood.
Cupressus arizonica.
,, torulosa—Himalayan cypress.
Eucalyptus botryoides.
,, rostrata.
,, saligna.
Jacaranda.
Salix babylonica—Weeping willow.
Thuya orientalis.

Shrubs

Prices f.o.r. Salisbury, 6d. each. Some of these are planted 4 in tin, but there is usually a fair stock in single tins.

Red.	Approx. height of growth.
Callistemon—Bottle brush	10 ft.
Euphorbia jacquinaflora	4 ft.
Habrothamnos newelli	5 ft.
Hibiscus, single	8 ft.
,, double	6 ft.
Holmskioldia	8 ft.
Iochroma	8 ft.
Plumiera (Frangipane)	8 ft.
Poinsettia	8 ft.
,, double red	8 ft.
Russellia	3 ft.
Tecoma capensis—Kaffir honeysuckle	6 ft.
Pink.	
Dombeya—Rhodesian mallow	10 ft.
Lagerstrœmia flos-regina—Indian crepe	10 ft.
Oleander—Double pink	10 ft.
Salvia	3 ft.
Sensitive plant	1 ft.

Mauve—Magenta.

	Approx. height of growth.
Althea—Christmas rose	5 ft.
Bauhinia	20 ft.
Bougainvillea	10 ft.
Lasiandra	6 ft.
Salvia	3 ft.

Blue.

Buddleia	6 ft.
Duranta	10 ft.
Heliotrope	3 ft.
Iochroma	8 ft.
Plumbago	3 ft.

White.

Bauhinia	20 ft.
Deutzia—Bridal wreath	5 ft.
Gardenia	4 ft.
Hawthorn—Evergreen	15 ft.
Lantana bush	8 ft.
Lemon-scented verbena	5 ft.
Plumiera (Frangipane)	8 ft.
Spirea—Cape may	4 ft.
Tree dahlia	8 ft.

Yellow.

Abutilon—Chinese lantern	8 ft.
,, Variegated leaf	8 ft.
Acacia cultriformis—Wattle	12 ft.
Alamanda nerifolia	4 ft.
Broom	8 ft.
Buddleia	10 ft.
Cape jasmine	10 ft.
Cassia—Cape laburnum	8 ft.
,, corymbosa	
,, canariensis	
,, didymobotrya	
,, eromophylla	
,, glauca	
,, occidentalis	
Cestrum aurantiacum	5 ft.
Holmskioldia	8 ft.
Hypericum—St. John's wurt	4 ft.
Michelia champaca	20 ft.
Poinsettia	8 ft.
Streptosolon Jamesonii	3 ft.
Tecoma Smithii	10 ft.
Thevetia nerifolia	6 ft.

Climbers.

Beaumontia—White.
Bougainvillea—Magenta.
Clitoria ternata—Mussel shell creeper—Blue.
Cereus grandiflora (queen of the night)—Yellow.
Dutchman's pipe (Aristolochia sypho)
Golden shower (Bignonia venusta).
Granadilla.
Honeysuckle—White.
,, Red.
Ivy.
Jasmine—White.
,, sambac—White.
,, Yellow.
Mandevillea—White.
Potato creeper (Solanum Wenlandii)—Blue.
Pterolobium lacerans—White; red seed pods.
Zimbabwe creeper (Podranea)—Pink.

Shrubs for Hedges

Price 3d. each; planted 16 in tin, weighing 25 lbs.

Holmskioldia—Red.
,, Yellow.
Lantana bush.
Macartney rose.
Spirea (Cape may).
Tecoma capensis—Red.

No orders can be supplied until paid for. Full particulars regarding forwarding should be addressed to the Government Agriculturist and Botanist, Department of Agriculture, Salisbury. If tins are not returned within a month they will be charged for at the rate of 6d. each.

List of Plants for Sale, Matopos Park Nursery.

In single tins at 3d.—Jacaranda, Pinus tœda, Grevillea robusta, Pinus longifolia, Lavender, Tecoma stans.

In single tins at 6d.—Poinsettia, Callistemon salignus, Abelia florabunda, Duranta plumieri, Fodranea, Jasmine, Hibiscus, Cassia grandiflora, Morus nigra, Pomegranate, Datura, Acacia cultriformis.

At 8s. 4d. per 100.—Casuarina quadrivalvis, Cupressus arizonica, Cupressus sempervirens, Pinus halepensis, Pinus pinaster, Pinus pinaster hamiltonii, Thuya occidentalis, Belhambra, Eucalyptus redunca, Eucalyptus hemiphloia, Eucalyptus resinifera, Eucalyptus longifolia, Eucalyptus microtheca, Eucalyptus polyanthema, Eucalyptus citriodora.

Applications for trees or plants from the Matopo Park nursery should be made to W. E. Dowsett, Rhodes Matopo Park, Matopos, and the prices quoted above are f.o.r. Matopos.

Departmental Bulletins.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution free of charge to applicants in Southern Rhodesia only:—

AGRICULTURE.

No. 64. Hints on Irrigation—Small Gravitation Schemes, by W. M. Watt
No. 81. Possibilities of Export Trade in Oil Seeds, by H. Godfrey Mundy, F.L.S.
No. 94. Second Report on Experiments, by J. H. Hampton.
No. 155. The Manuring of Maize on the Government Experimental Farm, Gwebi, 1912-13.
No. 160. Hints on Irrigation—Pumping Plants, by W. M. Watt, Agricultural Engineer.
No. 189. The Manuring of Maize on the Government Experiment Farm Gwebi, by G. N. Blackshaw, B.Sc., F.C.S.
No. 192. A Calendar of Crop Sowings, by H. Godfrey Mundy, F.L.S.
No. 196. Collection of Agricultural Statistics in Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 199. Eucalypts for the Farm, by J. J. Boocock.
No. 206. Hints on Irrigation: Small Earthen Storage Reservoirs, by W M. Watt.
No. 209. The Agricultural Returns for 1914, by B. Haslewood, F.S.S.
No. 212. Citrus Fruits in Rhodesia, by A. G. Turner.
No. 216. Manuring of Maize on Government Experiment Farm, Gwebi, by A. G Holborow, F.I.C.
No. 217. Windbreaks and Hedges, by F. B. Willoughby.
No. 218. Useful Measurements of Maize, by J. A. T. Walters, B.A.
No. 220. Reports on Crop Experiments, Gwebi, 1914-15, by E. A. Nobbs, Ph.D., B.Sc.
No. 221. Results of Experiments, Longila, 1914-15, by J. Muirhead.
No. 224. Statistical Returns of Crops, 1914-15, by E. A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 230. Farm and Live Stock Statistics, 1915, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 231. Estimates of Maize and Tobacco Crops, 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., and B. Haslewood, F.S.S.
No. 234. Eucalypts suitable to Southern Rhodesia, and how to Grow them, by F. B. Willoughby.
No. 236. Notes on Propagation by Means of Cuttings in Rhodesia, by F B. Willoughby.
No. 239. Reports on Crop Experiments, Gwebi, 1915-16, by E. A. Nobbs, Ph.D., B.Sc.
No. 240. Manuring of Maize and Fertiliser Experiments at Gwebi, by A. G. Holborow, F.I.C.
No. 246. Reports on Crop Experiments, Gwebi, 1915-16, Part II., by E. A. Nobbs, Ph.D., B.Sc.
No. 247. Statistical Returns of Crops grown by Europeans in Southern Rhodesia for the Season 1915-16, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture, and Fred. Eyles, F.L.S., Statistician.
No. 256. Prospects of Maize and Tobacco Crops, 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.

CROPS.

No. 310. Tobacco Cultivation, Selection and Grading, by H. W. Taylor, B.Agr.
No. 326. Tobacco Seed Beds, by H. W. Taylor, B.Agr.
No. 327. Linseed, by C. Mainwaring
No. 333. Tobacco Culture—Field Operations, by H. W. Taylor, B.Agr.
No. 334. Flue Curing Tobacco Barns and Packing House, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.

ENTOMOLOGY AND VEGETABLE PATHOLOGY.

No. 139. Termites, or "White Ants," by Rupert W. Jack, F.E.S.
No. 142. The Bean Stem Maggot, by R. W. Jack, F.E.S.
No. 147. Root Gallworn, by R. W. Jack, F.E.S.
No. 148. Darkling Beetle Grubs Injurious to Tobacco, by R. W. Jack. F.E.S.
No. 154. Borers in Native Timber—Results of Experiments with Preservatives, by Rupert W. Jack, F.E.S.
No. 158. Two Ladybirds Injurious to Potato Plants, by R. W. Jack, F.E.S
No. 171. The Cabbage Web-Worm—A Pest of Cabbage and Allied Plants, by R. W. Jack, F.E.S.
No. 172. Diseases of the Potato Tuber and the Selection of Sound Seed, by R. W. Jack, F.E.S.
No. 178. Illustrations of Natural Forest in relation to Tsetse Fly, by R W. Jack, F.E.S.
No. 187. The Dusty Surface Beetle, by Rupert W. Jack, F.E.S.
No. 197. Chafer Beetles, by R. W. Jack, F.E.S.
No. 204. Some Injurious Caterpillars, by R. W. Jack, F.E.S.
No. 214. Some Household Insects, by R. Lowe Thompson, B.A.
No. 219. More Household Insects, by R. Lowe Thompson, B.A.
No. 228. Rhodesian Citrus Pests, by R. W. Jack, F.E.S.
No. 233. Does it Pay to Spray Potatoes in Southern Rhodesia? by Rupert W. Jack, F.E.S.
No. 249. Home-made Fly Papers, by Rupert W. Jack, F.E.S., Government Entomologist.
No. 261. Turnip Sawfly, by R. W. Jack, F.E.S.
No. 276. The Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 280. The Maize Beetle, by R. W. Jack, F.E.S.
No. 290. Notes on Remedies for Turnip Sawfly, by Rupert W. Jack, F.E.S.
No. 291. Cutworms, by Rupert W. Jack, F.E.S.
No. 295. Tsetse Fly in Southern Rhodesia, 1918, by Rupert W. Jack, F.E.S.
No. 302. A Note on the Maize Stalk Borer, by Rupert W. Jack, F.E.S.
No. 317. Maize Culture on Red Soil; Value of Poisoned Bait as an Aid to Good Stands, by Rupert W. Jack, F.E.S.

VETERINARY.

No. 50. Epizootic Abortion in Cattle, by Ll. E. W. Bevan, M.R.C.V.S
No. 51. Strangles, by F. D. Ferguson, M.R.C.V.S.
No. 65. Common Ailments of the Horse, by D. R. Chatterley. M.R.C.V.S.
No. 82. Difficult Parturition of the Cow, by C. R. Edmonds, M.R.C.V.S., G.V.S.
No. 95 Oestrus-ovis in Sheep, by Alec King.
No. 121. Rabies, by Ll. E. W. Bevan, M.R.C.V.S., and T. G. Millington. M.R.C.V.S., D.V.H.
No. 165. Report of Veterinary Conference, Bulawayo, April, 1913.
No. 191. Scab or Scabies in Sheep and Goats, by Rowland Williams. M.R.C.V.S.
No. 202. Distomatosis or Liver Fluke in Cattle and Sheep, by Rowland Williams, M.R.C.V.S.

No. 223. A Note on Contagious Abortion, by Ll. E. W. Bevan, Government Veterinary Bacteriologist.
No. 272. African Coast Fever, by J. M. Sinclair, M.R.C.V.S., Chief Veterinary Surgeon.
No. 289. Contagious Abortion in Cattle, by Sir Arnold Theiler, K.C.M.G.
No. 312. Anthrax, by C. R. Edmonds, M.R.C.V.S.
No. 313. Obstruction in Sheath of Ox, by J. M. Sinclair, M.R.C.V.S.
No. 316. Inoculation of Cattle against Redwater and Gall-sickness, by Ll. E. W. Bevan, M.R.C.V.S.
No. 324. Infectious Abortion of Cattle, by Ll. E. W. Bevan, M.R.C.V.S.
Services of Government Veterinary Surgeons.

LIVE STOCK.

No. 123. Feeding and Care of Imported Bulls, by R. C. Simmons.
No. 145. Prospects for Importation of Cattle from Australia, by Eric A Nobbs, Ph.D., B.Sc.
No. 190. The Principle of the Winter Feeding of Dairy Cattle, by R. C. Simmons.
No. 195. Some Notes on the Systematic Dipping of Stock, by C. R. Edmonds, Assistant Chief Veterinary Surgeon, and Ll. E. W. Bevan, Government Veterinary Bacteriologist, Southern Rhodesia.
No. 198. Poultry Keeping for the Rhodesian Farmer, by Frank Sheppard.
No. 208. Water in the Diet of Live Stock, by Ll. E. W. Bevan, M.R.C.V.S.
No. 210. The Care and Feeding of Calves in Dairy and Stud Herds, by R. C. Simmons.
No. 211. The Fattening of Pigs on Granite Farms in Mashonaland, by R C. Simmons.
No. 227. An Experiment in Beef Production, by R. C. Simmons.
No. 229. Breeding and Feeding of Pigs for Bacon Factory Purposes, by R. C. Simmons.
No. 243. Shedding for Milch Cows, by R. C. Simmons.
No. 245. Beef Feeding Experiment No. 2, by R. C. Simmons.
No. 248. A Preservative for Samples of Arsenical Dips for Analysis, by A. G. Holborow, F.I.C., Assistant Government Agricultural Chemist
No. 250. Beef Feeding Experiment No. 3, by R. C. Simmons.
No. 263. How to Build a Cattle Crush (two methods), by J. H. Fleming and R. C. Simmons.
No. 277. A Farm Cheese and Butter Dairy, by R. C. Simmons and G. U. Fripp.
No. 284. Establishment of Dairy Herd on Granite Veld, by R. C. Simmons.
——— Arsenite Cattle Dip—How to Mix.
No. 286. Statistics of Live Stock and Animal Produce for the Year 1917, by Eric A. Nobbs, Ph.D., B.Sc., and F. Eyles, F.L.S.
No. 287. Sheep Farming for Mutton Purposes on Granite Veld and Mixed Farms, by R. C. Simmons.
No. 288. Stock Records for Ranches in Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc.
No. 292. Branding and Drafting Pens, by R. C. Simmons.
No. 301. Pigs as an Adjunct to Dairying on Granite Veld Farms, by R. C. Simmons.
No. 314. Tampan or Poultry Tick, by A. Little.
No. 319. The Turkey, by Arthur Little.
No. 321. The Construction of Dipping Tanks for Cattle. Revised April, 1919.
No. 322. Statistics of Live Stock and Animal Produce, 1918, by F. Eyles, F.L.S.
No. 325. Contagious and Infectious Diseases of Poultry, by A. Little.
Strength of Cattle Dips.
No. 330. Poultry Keeping in Rhodesia—Incubation, by A. Little.
No. 331. Theory and Practice of Feeding Cattle in Southern Rhodesia, Part I., by R. C. Simmons.

No. 332. Notes on the Theory and Practice of Feeding Cattle in Southern Rhodesia, Part II., by R. C. Simmons.
No. 335. Poultry Husbandry : The Rearing of Chicks, by A. Little.
No. 336. Butchering and Flaying.
No. 337. Poultry Diseases : Enteritis, Tuberculosis, Coccidiosis.

MISCELLANEOUS.

No. 93. Formation of Agricultural Credit Associations in Rhodesia, by Loudon M. Douglas, F.R.S.E.
No. 129. How to Make Use of the "Fencing Ordinance, 1904," by N. H Chataway.
No. 152. A School of Agriculture for Southern Rhodesia, by Eric A. Nobbs, Ph.D., B.Sc., Director of Agriculture.
No. 184 Cream—Its Separation, Handling and Sale to Butter Factories, by R. C. Simmons.
No. 186. Concrete and Reinforced Concrete, by E. Hardcastle, M.I.E.E.
No. 205. Home Butter Making, by R. C. Simmons.
No. 213. Hydraulic Rams, by W. Martin Watt.
No. 226. Classification of Clouds.
No. 241. Hints on Cement Concrete, by W. M. Watt.
No. 254. Hints on Explosives, by W. M. Watt.
No. 255. Pound Fees.
No. 264. Nature Notes—Adaptation, by C. F. M. Swynnerton, F.L.S.
No. 265. Rose Culture, by N. L. Kaye Eddie.
No. 270. Odzani River Irrigation Scheme, by W. M. Watt.
No. 271. Nature Notes—Plant Collecting, by F. Eyles, F.L.S.
No. 273. Enkeldoorn Produce Express Syndicate Rules.
No. 274. Lecture on Malaria and Blackwater, by A. M. Fleming, C.M.G., M.B., C.M., F.R.C.S.E., D.P.H., Medical Director.
No. 283. Maize Foods for the Home.
No. 294. Directions for taking Samples for Analysis, by E. V. Flack, Acting Agricultural Chemist.
No. 297. A Home-made Windmill, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 307. Rainfall Statistics, by A. C. Jennings, A.M.Inst.C.E., A.M.I.E.E.
No. 308. Cream Cheese, by J. B. Fisher, N.D.D.
No. 311. Gouda Cheese Making, by J. B. Fisher, N.D.D.
No. 318. Notes on Mining Law for Farmers, by Advocate D. E. McCausland, M.A., LL.B.
No. 323. Bacon Curing on the Farm, by Jas. B. Fisher, N.D.D.
No. 328. Pont l'Eveque Cheese, by J. B. Fisher, N.D.D.
No. 329. Gervais Cheese, by J. B. Fisher, N.D.D.
Malarial Fever : How it is caused and how it may be prevented, by Sir Ronald Ross, F.R.C.S., D.Sc., LL.D., F.R.S., K.C.B., etc.
Directory of Rhodesian Farmers and Ranchers.
The Analyses of Agricultural Products, Soils, Water, etc.
Lectures for Farmers.
Irrigation—Advice.

Employment on Farms.

The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS VACANT.

Partner to join farmer in agriculture (wheat and mealies), half share. Farmer has ploughs, oxen, etc., good ground and plenty of water. For further particulars, apply J. C. J.

SITUATIONS WANTED.

S. B. W.—Young man, 19 years old, wants situation on general farm as assistant. One year's experience at experiment station (cotton and tobacco). At present working on small horticultural farm. Excellent testimonials.

C. R.—Young man, just completed agricultural course at Potchefstroom, wishes to obtain employment on farm or ranch in Rhodesia. Has had three years' practical experience farming in Transvaal, and gained certificate of agriculture.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal.* This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 444 of 1919.] [10th October, 1919.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
J. M. Moubray	Mazimbanini	Mazoe	Farm Dillon

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 494 of 1919.] [7th November, 1919.

APPLICATION FOR USE OF WATER

in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
G. M. Young	Umtali	Umtali	Farm Durris

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

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The Department of Agriculture receives numerous enquiries from persons of varied attainments, age and financial position for openings on farms, as managers, assistants and learners, requiring remuneration on corresponding scales, or willing to give services in return for keep.

In order that work may be found for the above and needs of farmers met, applications are invited from both employers and persons seeking employment. Applications are also invited from artisans, such as masons, bricklayers, carpenters, fencers, well sinkers, concrete workers, and the like who may desire work on farms. In cases where employers have obtained the labour they require, or applicants for employment have found work, it is requested that notification be at once sent to the Department of Agriculture, in order that unnecessary correspondence be avoided.

Replies to the following applications should be addressed to the initials of the advertisers, c/o Director of Agriculture, who will forward the letter to the party referred to.

Note.—The following advertisements will not be repeated unless the advertisers inform us they wish them to be continued:—

SITUATIONS VACANT.

Partner to join farmer in agriculture (wheat and mealies), half share. Farmer has ploughs, oxen, etc., good ground and plenty of water. For further particulars, apply J. C. J.

SITUATIONS WANTED.

S. B. W.—Young man, 19 years old, wants situation on general farm as assistant. One year's experience at experiment station (cotton and tobacco). At present working on small horticultural farm. Excellent testimonials.

C. R.—Young man, just completed agricultural course at Potchefstroom, wishes to obtain employment on farm or ranch in Rhodesia. Has had three years' practical experience farming in Transvaal, and gained certificate of agriculture.

Government Notices.

Government Notices affecting the farming industry will in future be published only *once* in the *Agricultural Journal.* This applies to original Notices and to amending Notices. Readers are, therefore, advised to preserve their files of back numbers of the *Journal*, to which they will be able to refer for information respecting the various laws, regulations, etc., in force.

No. 444 of 1919.] [10th October, 1919.

APPLICATION FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
J. M. Moubray	Mazimbanini	Mazoe	Farm Dillon

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 494 of 1919.] [7th November, 1919.

APPLICATION FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
G. M. Young	Umtali	Umtali	Farm Durris

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 521 of 1919.] [21st November, 1919.

APPLICATION FOR USE OF WATER
in terms of Chapter I. of the "Water Ordinance, 1913."

IT is hereby notified that the following application has been made, in terms of the "Water Ordinance, 1913," for authority to use water :—

Name of applicant.	From what river.	Native district of	For the purpose of irrigating a certain portion or portions of the
J. O. A. Fraser-Mackenzie	Hunyani	Lomagundi	Chiwe Estate

Any person or persons whose rights may be affected thereby are hereby called upon, in terms of the regulations published under Government Notice No. 439 of 1915, to lodge, within three months from the date hereof, at the office of the Water Registrar, Salisbury, from whom further particulars are obtainable, their objections (if any) to the granting of this application, together with a full statement of the grounds for such objections.

No. 466 of 1919.] [17th October, 1919.

ANIMALS DISEASES CONSOLIDATION ORDINANCE, 1904.

HIS Honour the Acting Administrator in Council has been pleased, under the provisions of the "Animals Diseases Consolidation Ordinance, 1904," to cancel Government Notice No. 289 of 1919, and, in terms of section 17 of Government Notice No. 21 of 1917, to declare the following area of infection and guard area in lieu thereof :—

VICTORIA NATIVE DISTRICT.

(a) *Area of Infection.*

The farms Morgenster, Zimbabwe and Mzero.

(b) *Guard Area.*

Mlinya native reserve, farms Sikato, Longdale, Tentergate, Victoria native reserve, unalienated land lying between Victoria native reserve and Makorsi River Ranch and extensions, The Retreat, Le Rhone, Clifton and Oatlands.

No. 520 of 1919.] [21st November, 1919.

RABIES.

WHEREAS there has been an outbreak of rabies in the Bechuanaland Protectorate, His Honour the Acting Administrator in Council has been pleased, under the provisions of section 8 of the "Animals Diseases Consolidation Ordinance, 1904," to prohibit, until further notice, the introduction of all dogs from that Territory.

Any dogs introduced in contravention of this prohibition shall be destroyed.

No. 419 of 1919.] [26th September, 1919.

POUND—BROMLEY.

IT is hereby notified that His Honour the Administrator has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance,

1903," at the request of the Civil Commissioner, Salisbury, to establish a Pound at the farm Manor, near Bromley, in the magisterial district of Salisbury, and that the said Pound is now available for the public.

No. 420 of 1919.] [26th September, 1919.

POUND—SHABANIE RESERVE.

IT is hereby notified that His Honour the Administrator has been pleased, under the provisions of section 5 of "The Pounds and Trespasses Ordinance, 1903," at the request of the Civil Commissioner, Gwanda, to establish a Pound in the Shabanie Reserve, in the magisterial district of Gwanda, and that the said Pound is now available for the public.

NOTICE

The Agricultural Journal of Southern Rhodesia

is issued by the Department of Agriculture, and can be obtained upon application to the Editor. The Annual Subscription, which must be paid in advance, is 5/-, and payment may be made by any means other than by stamps.

Persons residing outside Southern and Northern Rhodesia and the Union of South Africa, may become subscribers by paying 4/- in addition to the subscription, to cover postage.

If payment is made by a cheque drawn on a bank outside Rhodesia, commission must be added.

All cheques and postal notes must be made payable to the Director of Agriculture.

Date,.................................19......

To the Editor,
"Rhodesia Agricultural Journal,"
Salisbury.

Please enrol me as a subscriber to the "Rhodesia Agricultural Journal" for one year from..........................
19......, for which I enclose..

Name..

Full Postal Address....................................

....

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Please write distinctly.